

UNIVERSITY OF MUMBAI

No.UG/ 354 of 2005
Mumbai 400 032
30th August, 2005

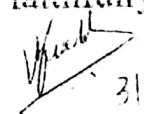
Professor-cum-Director,
Institute of Distance Education,
University of Mumbai,
Vidyasagari Campus,
Santa Cruz (East),
Mumbai - 400 098.

Sir,

I am to inform you that the proposal for the introduction of the Three year degree course in B.Sc. Nautical Technology through your Institute for the academic year 2005-2006 has been accepted by the Academic Council at its meeting held on 6th August, 2005 vide item No.7.3 and subsequently approved by the Management Council at its meeting held on 19th August, 2005 vide item No.3 and that in accordance therewith Three year degree course in B.Sc. Nautical Technology has been instituted by the University through your Institute from the academic year 2005-2006.

Further that in exercise of the powers conferred upon the Management Council under Section 54(1) and Section 55(1) of the Maharashtra Universities Act 1994, it has made the Ordinances 5565, 5566, 5567, 5568, 5569, 5570, 5571, 5572 and 5573 and Regulations 5281, 5282, 5283, 5284, 5285, 5286, 5287, 5288, 5289, 5290, 5291, 5292 and 5293 including scheme of papers, syllabus and standard of passing for the Three year degree course in B.Sc. Nautical Technology is as per Appendix and that the same has been brought into force with effect from the academic year 2005-2006.

Yours faithfully,


31/8
for REGISTRAR.

AC/73/06.08.2005

No.UG/ 354-A of 2005

30th August, 2005

Copy forwarded with compliments to the Dean, Faculty of Science, for information.


31/8
for REGISTRAR.

**B.Sc. NAUTICAL
TECHNOLOGY
COURSE**

**INSTITUTE OF
DISTANCE EDUCATION
UNIVERSITY OF MUMBAI**

2005 – 2006

B.Sc. NAUTICAL TECHNOLOGY COURSE

INSTITUTE OF DISTANCE EDUCATION
UNIVERSITY OF MUMBAI

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B. Sc. NAUTICAL TECHNOLOGY COURSE

INSTITUTE OF DISTANCE EDUCATION

UNIVERSITY OF MUMBAI

EXECUTIVE SUMMARY

Shipping companies, both Indian and Foreign, have been recruiting trainees at 10+2 (PCME) level for the nautical department of their ships for over 30 years.

Currently, the trainees are required to undergo 6 months (1 Semester) of Campus-based residential pre-sea training at an institute approved by the Directorate General of Shipping, Ministry of Shipping, Road Transport and Highways

This is followed by 24 months of prescribed sea service (practical ship-board training) in 3 or 4 tours of contract of 6-8 months duration with intermediate leave periods of 2-4 months each time. On completion of this sea service the trainees undergo a total of further 6 months post-sea education and training courses at the institutes approved by the Directorate General of Shipping.

The trainees then appear for the examination conducted by the Directorate General of Shipping, to obtain Certificate of Competency as Officer in Charge of a Navigational Watch on foreign going ships.

This qualification, being recognised internationally, they become eligible to work as Navigating Officers on Indian and foreign ships in any part of the world.

With further shipboard experience as an officer, undertaking higher level mandatory training courses, and promotional examinations conducted by the DGS, an officer rises to take command of the ship as a Captain.

In spite of growing so high professionally right up to being the Captain of the ship, they face a handicap in terms of academic qualifications. This hinders potential growth in terms of opportunities in shore management and other fields, as he is unable to undertake any higher studies or management courses, etc.

To overcome this lacuna, and to enhance their academic qualification, the University of Mumbai has started this course through Institute of Distance Education leading to a degree in B. Sc Nautical Technology.

Mumbai University has already been conducting:

1. Full time B.Sc. Nautical Sciences course at Training ship Chanakya, Navi Mumbai, for about 18 years.
2. Full time B.Sc. Maritime Science Course at Marine Engineering and Research Institute, Hay Bunder, Mumbai for the past two years.

3. Full time B.E. Marine Engineering Course at Vasant Dada Patil College of Engineering at Sion-Chunabhatti for the last two years.

The **University of Mumbai**, with its expertise and experience in the shipping field, and being located in the **shipping capital of the country**, is best placed to start this programme.

This programme will go a long way in development of shipping personnel and their academic qualifications and thus enhance their professional growth and open new avenues hitherto not available to them.

The Salient features of the course are:

1. **Nomenclature:** B.Sc. Nautical Technology
2. **Duration:** 3 Years.
3. **Type:** Distance Education.
4. **Eligibility:** 10+2 PCME or equivalent (XI Std. for Pre-10+2 system) & Sponsored by a shipping company for providing 24 months of practical structured ship-board training as an officer trainee in the nautical department of a sea-going ship as approved sea-going service.
5. **Enrolments:** Several hundred students are expected to enrol each year.
6. **Fees:** Rs.10,000/- per year.
7. **Examination fees:** Rs.1,000/- per exam.
8. **Mode of Payment:** All fees is payable to the University of Mumbai directly by the student.
9. **Faculty:** As and when required, experts from the shipping industry can be engaged by the University on visiting faculty basis as per the norms and rates set by the University for the development of the programme, course material and delivering contact lectures, if required.
10. **Faculty Qualification:** Certificate of Competency as Master (Captain) of a Foreign Going ship and minimum three years teaching experience in a maritime training institute or Extra Master / Post Graduate in a maritime related field.
11. **Examination:** All examinations will be carried out by the IDE or the University at the place designated as per the norms and the standards set by the University.
12. **Experts :** Experts empanelled as faculty can be engaged to work as Paper setters or examiners / moderators as per the norms and rates set by the University. (*list enclosed as List I*)

13. **Masters Programme:** In future Mumbai University may also start a Masters Programme in Nautical Technology through Distance Education.
14. **Existing Navigating officers:** There are thousands of existing navigating officers, already employed at high levels in the shipping industry, both afloat and ashore, who have not had the opportunity to enrol for a University Graduate Education programme, though they have years of experience and sufficient knowledge to embark on this programme.

It is intended to allow them to be eligible for this Distance Education Programme" and qualify themselves academically. The University will benefit from a large number of candidates and become a significant contributor in raising the academic level of the professionals in the maritime industry.

15. **Frequency of Enrolment:** Every ship is required to be manned by a specified minimum number of officers at all times (7 days a week, 12 months a year) whether at sea or in port. Generally the tour of contract is 6-7 months for an officer; thereafter he is replaced by an equivalently qualified officer for another tour of contract of 6-7 months. The same cycle continues ever after.

It is for this special type of requirement, that the enrolment and commencement of academic year is required to be TWICE a year.

16. **ATKTs :** The passing percentage is set at a very high level, on an average 60%, therefore it is necessary that an ATKT is permitted in THREE subjects rather than the normal TWO wherein the pass percentage of 35%.

UNIVERSITY OF MUMBAI

Ordinances and Regulations relating to
Degree of B. Sc. Nautical Technology

B. Sc. Nautical Technology

O. 5565: The course for the degree of B. Sc. Nautical Technology shall be of three years duration

O. 5566: A candidate for being eligible for admission to the B. Sc. Nautical Technology Degree Course:

- 1) must have passed the Higher Secondary School Certificate or equivalent (Standard XII) Examination conducted by the Maharashtra State Board of Secondary Education, Mumbai or an examination of any other body recognised as equivalent thereto, with the following subjects: English, Physics, Chemistry, and Mathematics

OR

Standard XI for candidates who have passed before 1978, with the following subjects: English, Science, and Mathematics

- 2) has been sponsored by a shipping company through their respective Associations as an officer trainee in the Nautical Department of a sea-going ship for a minimum of twenty-four months of practical shipboard training as approved sea-going service (To begin with, a list of participating shipping companies, who are members of INSA, FOSMA and MASSA is enclosed at Appendix 1, 2 and 3 respectively);

OR

has already performed a minimum of twenty-four months of practical shipboard training as approved sea-going service as an officer trainee in the Nautical Department of a sea-going ship (Testimonial to be submitted as proof in the form of "Sea-time Certificate" from the shipping company or Attested copy of Continuous Discharge Certificate or the certificate of competency as Navigating Officer on completion of such training)

O. 5567: In view of the special nature of the sea-going service, the enrolment at the beginning of the course and for the second and third year thereafter, shall be twice a year, i.e. first half and second half, to enable the students to complete the respective academic year, and appear for the examination i.e. first half and second half examination respectively.

O.5568 : There shall be an examination at the end of each year of the course. The examination at the end of First and Second year shall be conducted by IDE and the final examination at the end of Third Year for the award of Degree of Bachelor of Science in Nautical Technology shall be conducted by the University.

R.528/: The candidates shall be examined in the following subjects:-

FIRST YEAR

Unit No.	Subject/Title
1	Basic Terrestrial Navigation Technology – Paper I
2	Basic Celestial Navigation Technology – Paper I
3	Basics of Bridge Watch-keeping Technology – Paper I
4	Basic Cargo Handling and Stowage Technology – Paper I
5	Basic Ship Construction and Stability – Paper I
6	Basic Ship Operation Technology – Paper I

SECOND YEAR

Unit No.	Subject/Title
1	Applied Terrestrial Navigation Technology – Paper II
2	Applied Celestial Navigation Technology – Paper II
3	Applied Bridge Watch-keeping Technology -- Paper II
4	Applied Cargo Handling and Stowage Technology – Paper II
5	Applied Ship Construction and Stability – Paper II
6	Applied Ship Operation Technology – Paper II

THIRD YEAR

Unit No.	Subject/Title
1	Terrestrial Navigation Technology – Paper III
2	Celestial Navigation Technology – Paper III
3	Bridge Watch-keeping Technology – Paper III
4	Cargo Handling and Stowage Technology – Paper III
5	Ship Construction and Stability – Paper III
6	Ship Operation Technology – Paper III

First Year B. Sc. Nautical Technology Examination

O. 5569: A candidate for being eligible for admission to the First Year B.Sc. Nautical Technology Examination shall produce a testimonial of having enrolled for the First Year of B.Sc. Nautical Technology Degree Course at least one Academic Year in advance of the Examination.

R. 5282: Candidates for the first year shall be examined in the subjects as indicated below:

Unit No.	Subject/Title	Duration of Examination	Maximum Marks
1	Basic Terrestrial Navigation Technology – Paper I	3 Hours	100
2	Basic Celestial Navigation Technology – Paper I	3 Hours	100
3	Basics of Bridge Watch-keeping Technology – Paper I	3 Hours	100
4	Basic Cargo Handling and Stowage Technology – Paper I	3 Hours	100
5	Basic Ship Construction and Stability – Paper I	3 Hours	100
6	Basic Ship Operation Technology – Paper I	3 Hours	100

R. 5283: The following are the syllabi in various subjects prescribed for the First Year Examination of the B.Sc. Nautical Technology Degree Course (ANNEX I)

Standard for passing at the First Year
B. Sc. Nautical Technology Examination

R. 5284: To pass the First Year Examination, a candidate must obtain a minimum marks required for passing in each subject for passing as shown below:-

Unit No.	Subject/Title	Pass Marks
1	Basic Terrestrial Navigation Technology – Paper I	70
2	Basic Celestial Navigation Technology – Paper I	70
3	Basics of Bridge Watch-keeping Technology – Paper I	50
4	Basic Cargo Handling and Stowage Technology – Paper I	60
5	Basic Ship Construction and Stability – Paper I	60
6	Basic Ship Operation Technology – Paper I	50

R. 5285: An unsuccessful candidate who secures minimum marks required for passing in a subject, may at his option, be exempted from appearing in that subject at subsequent attempt, and shall be declared to have passed the whole examination on his passing in the remaining subject/s.

Second Year B. Sc. Nautical Technology Examination

O. 5570: No candidate shall be permitted to the Second Year Examination of B.Sc. Nautical Technology Degree Course unless:

- 1) he/she has passed the First Year B.Sc. Nautical Technology Examination,
- 2) has enrolled for the Second Year of B.Sc. Nautical Technology Degree Course at least one Academic Year in advance of the Examination, and
- 3) has already performed a minimum of eight months of practical shipboard training as approved sea-going service as an officer trainee in the Nautical Department of a sea-going ship (Testimonial to be submitted as proof in the form of "Sea-time Certificate" from the shipping company or Attested copy of Continuous Discharge Certificate or certificate of competency as navigating officer).

O. 5571: Notwithstanding what is contained in O ____ Para 1), a candidate who fails at the first Year Examination in not more than three subjects mentioned below shall be permitted to keep terms for the Second Year of the B.Sc. Nautical Technology Degree Course, but shall not be declared to have passed the Second Year Examination unless he/she has passed in all the subjects of the First Year Examination either previously or simultaneously with the Second Year Examination.

Unit No.	Subject/Title
1	Basic Terrestrial Navigation Technology – Paper I
2	Basic Celestial Navigation Technology – Paper I
3	Basics of Bridge Watch-keeping Technology – Paper I
4	Basic Cargo Handling and Stowage Technology – Paper I
5	Basic Ship Construction and Stability – Paper I
6	Basic Ship Operation Technology – Paper I

R. 5286: Candidates for the second year shall be examined in the subjects as indicated below:

Unit No.	Subject/Title	Duration of Examination	Maximum Marks
1	Applied Terrestrial Navigation Technology – Paper II	3 Hours	100
2	Applied Celestial Navigation Technology – Paper II	3 Hours	100
3	Applied Bridge Watch-keeping Technology – Paper II	3 Hours	100
4	Applied Cargo Handling and Stowage Technology – Paper II	3 Hours	100
5	Applied Ship Construction and Stability – Paper II	3 Hours	100
6	Applied Ship Operation Technology – Paper II	3 Hours	100

R. S287: The following are the syllabi in various subjects prescribed for the Second Year Examination of the B.Sc. Nautical Technology Degree Course (ANNEX II)

Standard for passing at the Second Year
B. Sc. Nautical Technology Examination

R. S288: To pass the Second Year Examination, a candidate must obtain a minimum marks required for passing in each subject for passing as shown below:-

Unit No.	Subject/Title	Pass Marks
1	Applied Terrestrial Navigation Technology – Paper II	70
2	Applied Celestial Navigation Technology – Paper II	70
3	Applied Bridge Watch-keeping Technology – Paper II	50
4	Applied Cargo Handling and Stowage Technology – Paper II	60
5	Applied Ship Construction and Stability – Paper II	60
6	Applied Ship Operation Technology – Paper II	50

R. S289: An unsuccessful candidate who secures minimum marks required for passing in a subject, may at his option, be exempted from appearing in that subject at subsequent attempt, and shall be declared to have passed the whole examination on his passing in the remaining subject/s.

Third Year B. Sc. Nautical Technology Examination

O. S572: No candidate shall be permitted to the Third Year Examination of B.Sc. Nautical Technology Degree Course unless:

- 1) he/she has passed the Second Year B.Sc. Nautical Technology Examination,
- 2) has enrolled for the Third Year of B.Sc. Nautical Technology Degree Course at least one Academic Year in advance of the Examination, and
- 3) has already performed a minimum of twenty-four months of practical shipboard training as approved sea-going service as an officer trainee in the Nautical Department of a sea-going ship (Testimonial to be submitted as proof in the form of "Sea-time Certificate" from the shipping company or Attested copy of Continuous Discharge Certificate or certificate of competency as navigating officer).

O. 5573: Notwithstanding what is contained in O ____ Para 1), a candidate who fails at the Second Year Examination in not more than three subjects mentioned below shall be permitted to keep terms for the Third Year of the B.Sc. Nautical Technology Degree Course, but shall not be declared to have passed the Third Year Examination unless he/she has passed in all the subjects of the Second Year Examination either previously or simultaneously with the Third Year Examination.

Unit No.	Subject/Title
1	Applied Terrestrial Navigation Technology – Paper II
2	Applied Celestial Navigation Technology – Paper II
3	Applied Bridge Watch-keeping Technology – Paper II
4	Applied Cargo Handling and Stowage Technology – Paper II
5	Applied Ship Construction and Stability – Paper II
6	Applied Ship Operation Technology – Paper II

R. 5290: Candidates for the third year shall be examined in the subjects as indicated below:

Unit No.	Subject/Title	Duration of Examination	Maximum Marks
1	Terrestrial Navigation Technology – Paper III	3 Hours	100
2	Celestial Navigation Technology – Paper III	3 Hours	100
3	Bridge Watch-keeping Technology – Paper III	3 Hours	100
4	Cargo Handling and Stowage Technology – Paper III	3 Hours	100
5	Ship Construction and Stability – Paper III	3 Hours	100
6	Ship Operation Technology – Paper III	3 Hours	100

R. 5291: The following are the syllabi in various subjects prescribed for the third Year Examination of the B.Sc. Nautical Technology Degree Course (ANNEX III)

Standard for passing at the Third Year
B. Sc. Nautical Technology Examination

R. 5292: To pass the Third Year Examination
(i) a candidate must obtain a minimum marks required for passing in each subject for passing as shown below:-

Unit No.	Subject/Title	Pass Marks
1	Terrestrial Navigation Technology – Paper III	70
2	Celestial Navigation Technology – Paper III	70
3	Bridge Watch-keeping Technology – Paper III	50
4	Cargo Handling and Stowage Technology – Paper III	60
5	Ship Construction and Stability – Paper III	60
6	Ship Operation Technology – Paper III	50

(ii) Award of Class to successful candidates shall be on the basis of marks obtained at Third Year B.Sc. Nautical Technology Examination as indicated below:

	Class	First Class	First Class with Distinction
Total	Overall Class	360 marks	420 marks

R. 529/3 : An unsuccessful candidate who secures minimum marks required for passing in a subject, may at his option, be exempted from appearing in that subject at subsequent attempt, and shall be declared to have passed the whole examination on his passing in the remaining subject/s. Such candidate shall not be eligible for a class, prize or scholarship, awarded at the examination.

University of Mumbai

Institute of Distance Education

Syllabus for

**First Year
B. Sc. Nautical Technology**

Effective from 2005-2006

First Year B. Sc. Nautical Technology				
Unit No.	Subject / Paper	Duration of Exam	Max Marks	Pass Marks
1	Basic Terrestrial Navigation Technology – Paper I Part 1. Basic Principles of Terrestrial Navigation Part 2: Exercises in Terrestrial Navigation Part 3: Basic Chart Work	3 Hours	100	70
2	Basic Celestial Navigation Technology – Paper I Part 1. Basic Principles of Celestial Navigation Part 2. Elementary Exercises in Celestial Navigation Part 3. Spherical trigonometry	3 Hours	100	70
3	Basics of Bridge Watch-keeping Technology – Paper I Part 1. Bridge Equipment, Electronic Navigation Aids, Elements of Watchkeeping and Collision Regulations Part 2. Introduction to Ship's Weather Observations and Instruments Part 3. Signals and Concept of Global Maritime Distress and Safety Systems (GMDSS)	3 Hours	100	50
4	Basic Cargo Handling and Stowage Technology- Paper I Part 1. Cargo Gear, Cargo Handling and Stowage Part 2. Oil, Chemical, Gas Tanker and Passenger Ship Familiarisation	3 Hours	100	60
5	Basic Ship Construction and Stability – Paper I Part 1. Basic Ship Construction Part 2. Elements of Ship Stability	3 Hours	100	60
6	Basic Ship Operation Technology- Paper I Part 1. Basic Safety and Legislation Part 2. Types of Marine Pollution and its Prevention Part 3. Basic Seamanship	3 Hours	100	50

Part 1: Basic Principles of Terrestrial Navigation

1. Shape of the Earth, Axis of Rotation, Pole, Equator, Parallel of Latitude, Latitude, Meridian & Longitude. D'lat & D'long. Departure and the relationship between Departure, D'long & Latitude. Mean Latitude & Mid-Latitude. Nautical Mile, geographic mile, Statute mile. Great Circle, Spherical Triangle.
2. Ship's Log, Log Distance, Dead Reckoning and Estimated Positions.
3. Mercator Projection. Meridional Parts & DMP.

Part 2: Exercises in Terrestrial Navigation

4. Exercises in determining Departure, D'long & D'lat between two points on the earth's surface. Plane Sailing Formulae & exercises on their use.
5. Traverse Tables - Course & Distance between two points on the earth's surface.
6. Exercises on Day's Work.
7. Mercator Sailing Formulae and exercises on their use.

Part 3: Basic Chart work

8. The Mercator chart - Natural scale, Latitude scale, Longitude scale, and the relation between latitude & longitude scales. Determination of distance on a Mercator chart. Chart reading. Transferring position lines and courses on Mercator charts. Plotting ship's position on a Mercator chart, the use of parallel ruler, set Square, compass, divider. Care & maintenance of charts. Symbols & abbreviations used on Nautical Charts.
9. The Compass Rose. Compass, Magnetic & True Course and Bearing. Deviation, Variation & Deviation Card. Exercises on the conversion of Courses & Bearings between Compass, Magnetic & True.
10. Dead Reckoning and Observed positions and the symbols used for indicating them on the chart. Fixing vessel's position using terrestrial cross-bearings and bearing and range. Course steered, course made good, engine speed, speed made good, current, leeway, counteracting current & leeway, estimated position (EP) and the symbol used to denote EP.
11. Elementary knowledge of Admiralty Chart Catalogue & the Admiralty Chart Folio System. Layout of the ship's chart outfit.
12. Contents of Admiralty List of Lights. Characteristics of lights.
13. Introduction to Buoyage Systems in use worldwide.
14. Use of Tide Tables at Standard Ports. Admiralty Sailing Directions and other publications.
15. Conduct exercises in above chart work techniques.

Books recommended for reference	Author	Publisher	Year/Edn
Practical Navigation Plus Nautical Almanac	Capt. H. Subramaniam	Vijaya Publication	4 th Ed / 1992
Nories Nautical Tables	Norie	Blance	1994
Burton's Nautical Tables	Burton		3 rd Ed
Principles Of Navigation	Capt. Joseph & Capt. Rewari	Applied Research International	1 st Edition
Chartwork	Capt. S. S. Chaudhary		
Chartwork for Mariners	Capt. S. K. Puri	Marine Pub.of India	1993/5th Ed
Voyage/Passage Planning and Chartwork	Capt. M. V. Naik & Capt. Varty		1993

Pattern of Question Paper

First Year B. Sc. Nautical Technology

Basic Terrestrial Navigation Technology – Paper I

Duration: 3 hours

Max Marks: 100

Pass marks: 70

Note:

1. Use of Non-scientific calculator, Nories/Burton's Tables, Tide Tables and Nautical Almanac IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Part 1: Basic Principles of Celestial Navigation

1. Solar system. Revolution of the Earth and the position of the solstices and equinoxes. Seasons. Keplers Laws of Planetary motion.
2. Concept of Time and its relationship with Longitude on the earth's surface. Explain GMT, Zone Time, Standard Time & Apparent Time.
3. Rational Horizon, Visible Horizon & Sensible Horizon. Ecliptic system, Equinoctial system, and horizon system of describing positions of celestial bodies. Zenith, Nadir, Vertical Circles, Prime Vertical, True Altitude, Zenith Distance, Declination, Polar Distance, Hour Angles, Aries & Azimuth.
4. Correction of altitudes using Dip, Refraction & SD separately and also using total correction tables. Latitude by Meridian Altitude. Amplitude & Azimuth.
5. Nautical Almanac. Method of obtaining times of Twilight, Rising, Setting, & Meridian Passage from the Nautical Almanac.

Part 2: Elementary Exercises in Celestial Navigation

6. Exercises in drawing figures, reasonably to scale, on the plane of rational horizon.
7. Calculation to obtain true altitude of the Sun. Calculation of obtaining Compass Error using the above using nautical tables. Exercises of obtaining times of Twilight, Rising, Setting, & Meridian Passage from the Nautical Almanac.
8. Knowledge of Star Constellations.
9. Calculation of sights using longitude by chronometer and intercept methods.

Part 3: Spherical Trigonometry

10. Great circle, small circle, pole, spherical angle, spherical triangle. Properties of spherical angles and spherical triangles.
11. Sine & Cosine formulae and the possible ambiguities due to their use.
12. Haversine formula and its advantage over the Sine & Cosine formulae.
13. Right-angled spherical triangles and their properties. Exercises in the solution of right-angled spherical triangles using Napier's Rules.
14. Quadrantal spherical triangles and their properties. Exercises on the solution of quadrantal spherical triangles using Napier's Rules.
15. Polar triangles and their use in the solution of spherical triangles. Exercises on the solution of spherical triangles.

Books recommended for reference	Author	Publisher	Year/Edn
Practical Navigation Plus Nautical Almanac 1992	Capt. H. Subramaniam	Vijaya Publication	4 th Ed / 2004
Spherical Trigonometry	Capt. H. Subramaniam	Vijaya Publication	
Principles Of Navigation	Capt. Joseph & Capt. Rewari	ARI	-
Nories Nautical Tables	Norie	Blance	1994
Burtons Nautical Tables	Burton		
Star Chart	Bernard		

Pattern of Question Paper

First Year B. Sc. Nautical Technology

Basic Celestial Navigation Technology – Paper I

Duration: 3 hours

Max Marks: 100

Pass marks: 70

Note:

1. Use of Non-scientific calculator, Nories/Burton's Tables, Tide Tables and Nautical Almanac IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Duration: 3 hours

Max Marks: 100

Pass marks: 50

Part 1: Bridge Equipment, Electronic Navigation aids, Elements of Watch-keeping and Collision Regulations

1. Collision Regulations with specific emphasis on Rules: 3, 5, 7, 8, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 & Annexure IV.
2. Parts and Principle of Sextant. Correctable errors of a sextant and methods of correction.
3. Knowledge of Marine Chronometer. Chronometer error log. Exercises on accumulated rates.
4. Knowledge of Wet Card Magnetic Compass. Gyrocompass, Repeaters, and Course Recorder.
5. Principles of Echo Sounder to measure depths below the ship.
6. Basic working of Marine Radar.
7. Knowledge of Watch keeping duties at anchor and at sea. Duties associated with preparing a vessel to proceed to sea. Procedure of testing controls. Procedure of taking over watch at sea. Recording all relevant information in Logbooks. Duties prior to arrival port. Procedure of embarking and disembarking a pilot. Methods to call the Master and the circumstances under which he should be called.

Part 2: Introduction to Ship's Weather Observations and Instruments

8. The atmosphere: Layers, atmospheric temperature: adiabatic changes, diurnal variation of atmospheric pressure - semi-diurnal variation, atmospheric temperature, barometric tendency.
9. Heat: Conduction, convection, radiation; insolation, seasons, temperature zones. Water vapour in the atmosphere, Hydrological cycle, precipitation, Visibility, types of fog.
10. Clouds: Classification & description of the ten basic types of clouds. International Cloud Atlas. The Ship's Weather Code. Exercises.
11. Pressure gradient, wind and waves: Isobars, pressure gradient, Coriolis force (geostrophic force); sea, swell, gust, squall, veering, backing; Buys Ballot's Law; Difference between True and Apparent wind. Beaufort scale and use of 'State of sea card'. Exercises involving true and apparent wind.
12. Knowledge of shipboard Meteorological instruments.

Part 3: Signals and Concept of Global Maritime Distress and Safety Systems (GMDSS)

13. Basic working knowledge of the GMDSS. Knowledge of Radio-telephony procedures.
14. Knowledge of the Morse code.
15. Exercises on the recognition and single letter meanings of International Code Flags.

Books recommended for reference	Author	Publisher	Year/Edn
Marine Meteorology Plus - Ship's Weather Code	Capt. H. Subramaniam	Vijaya Publication	2002 / 3 rd Ed
Bridge Procedures Guide	ICS	Marisec Pub.	1998 / 3rd Edn
Regs For Prevention Of Collisions At Sea (Rules Of The Road)	Bhandarkar Publications		
Nautical Watchkeeping	Capt. H. Subramaniam	Vijaya Publication	2001 / 2 nd Ed
Marine Radar	K. R. Bhandarkar	K. R. Bhandarkar	
Bridge Equipment & Watchkeeping	Capt. E. Fernandes	Pro-Navigator	
ROR Set Of Cards	Bhandarkar Publications		
Nories Nautical Tables	Norie	Blance	1994
GMDSS Handbook	Merchant		
Burtons Nautical Tables	Burton		

Pattern of Question Paper

First Year B. Sc. Nautical Technology

Basics of Bridge Watch-Keeping Technology – Paper I

Duration: 3 hours

Max Marks: 100

Pass marks: 50

Note:

1. Use of Non-programmable scientific calculator, Nories/Burton's Tables and Ship's weather code IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Part 1: Cargo Gear, Cargo Handling and Stowage

1. Use of derricks, cranes on ships.
2. Role of longshoremen, stevedores, foreman, ship's agent, supervisor.
3. Overall procedure of loading, stowing and discharging of general cargoes. Cargo documents. Stowage Factor and Load Density.
4. Procedure of preparing the hold for loading general cargo and bulk cargo. Necessity and procedure for segregation of various types of dry cargoes.
5. Various types of dunnage used. Securing of various types of cargo.
6. Cargo sweat, ship sweat, atmospheric sweat. Precautions against cargo damage by sweat.
7. Unitization of cargo by palletisation and containerization. Container ships.
8. Carriage of Refrigerated Cargo.
9. Classification and Labeling of dangerous Goods.
10. Procedure of keeping cargo watch in port.
11. Ballasting and Deballasting Operations, Pumps and pipelines, Principle of eductor system

Part 2: Oil, Chemical, Gas Tanker and Passenger Ship Familiarization

12. Oil Tankers - Tank arrangements. Piping and pumping arrangements. Tank cleaning, crude oil washing. Safety precautions, safety check lists.
13. Gas Tankers - Tank arrangements. Piping and pumping arrangements. Tank cleaning, Safety precautions, safety check lists.
14. Chemical Tankers - Tank arrangements. Piping and pumping arrangements. Tank cleaning, Safety precautions, safety check lists.
15. Passenger Ship Familiarisation - Disasters involving passenger ships. Emergency procedures. Passenger safety, cargo safety, hull integrity. Communications. Crowd management.

Books recommended for reference	Author	Publisher	Year/Edn
Cargo Work	Capt. E. Fernandes	Martinez Enterprises	1993/1 st Ed
Seamanship - Theory and Practice	Graham Danton	Routledge	1996/11th Ed
Seamanship	D J House		1987/1 st Ed
IMO model course 1.01 (Old number) Oil tanker familiarization	IMO	IMO	1991 / 2 nd Ed
IMO model course 1.03 (Old number) Chemical Tanker Familiarization	IMO	IMO	
IMO model course 1.05 (Old number) Gas Tanker familiarization	IMO	IMO	
IMO model course 1.01 (New number) Oil, Gas and Chemical tanker familiarization	IMO	IMO	2000
IMO model course 1.29 Crisis management	IMO	IMO	
IMO model course 1.28 Crowd management	IMO	IMO	2000
Cargo Work	Capt. L. G. Taylor	Brown sons & Ferguson Ltd	1992/12 th Ed

Pattern of Question Paper

First Year B. Sc. Nautical Technology

Basic Cargo Handling and Stowage Technology – Paper I

Duration: 3 hours

Max Marks: 100

Pass marks: 60

Note:

1. Use of non-programmable scientific calculator, Norries/Burton's Tables ASTM Tables and Graph Paper IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Unit No. 5

BASIC SHIP CONSTRUCTION AND STABILITY – PAPER I

Duration: 3 Hours

Max. Marks 100

Pass Marks: 60

Part 1: Basic Ship Construction

1. Basic types of ships, i.e. General Cargo, Bulk Carrier, Container and Oil Tanker.
2. Principal dimensions of a ship.
3. Knowledge of principal parts of ship including Peak Tanks, Double Bottom Tanks, Deep Tanks, Cargo Tanks, Ballast Tanks, etc.
4. Knowledge of Ship plans: General Arrangement, Fire-fighting Appliances, Life-Saving Appliances, Pumping & Piping Arrangements.
5. Parts of a ship: Beam, Frame, Bulkhead, Hatch, Tank, Coaming, Hatch-Cover, Rudder, Deck, Hull, Bilge, Sounding Pipe, Air Pipe and Ventilator. Location of these on a ship.
6. Draft Marks & Load Lines. Method of reading draft marks in feet and in metres.
7. Causes and simple methods of prevention of corrosion in a ship's structure. Brief notes on paint technology & anti-corrosion techniques.
8. Dry Dock, the reasons for dry docking a vessel. A general idea of the activities in a dry dock.

Part 2: Elements of Ship Stability

9. Principle of flotation. Meaning of terms: Displacement, Deadweight, Form Coefficients, Reserve Buoyancy, Light Ship, Draft, Air Draft and Freeboard.
10. Tonnes per Centimetre Immersion (TPC). Formula for TPC.
11. Effect of density on the draft of a vessel.
12. Meaning of the terms Fresh Water Allowance (FWA) and Dock Water Allowance (DWA). State the formulae for FWA and DWA.
13. Centre of Gravity and its height from Keel (KG) of a ship. Factors that affect KG. Centre of Buoyancy and its height from Keel (KB). Factors that affect KB.
14. Stable, Unstable and Neutral Equilibrium and Angle of Loll.
15. Exercises in calculations based on the above topics.

Books recommended for reference	Author	Publisher	Year/Edn
Ship Stability I	Capt. H. Subramaniam	Vijay Publication	1981/1st Ed
Ship Construction	Kemp & Young	Elsevier India	1 st Ed/2003
M. V. HINDSHIP	Capt. Joseph & Capt. Rewari	ARI	2002/3rd Ed
HINDSHIP tables		Bhandarkar	
Ship Stability	D. R. Derretts.	Butterworth Heinemann	1999/5th Ed.



Pattern of Question Paper

First Year B. Sc. Nautical Technology

Basic Ship Construction and Stability – Paper I

Duration: 3 hours

Max Marks: 100

Pass marks: 60

Note:

1. Use of non - scientific calculator, Norics/Burton's Tables, Hindship Tables and Graph paper IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Part 1: Basic Safety and Legislation

1. Brief description of the functions of International and national maritime administration. Brief idea of Merchant Shipping Act and International Maritime Safety Conventions. Brief idea of Articles of Agreement.
2. Brief description of the Management for the safe operation of ships
3. Outline knowledge of the Security Procedures on ships and in port.

Part 2: Types of Marine Pollution and its Prevention

4. Regulations and methods of prevention of pollution under Marpol Annexes I to VI.
 - a) Pollution of the seas by Oil, Operational and accidental.
 - b) Chemical Carriers and the pollution caused by the effluents.
 - c) Pollution hazard by carriage of goods in packaged form.
 - d) Sewage at sea
 - e) Pollution due to garbage
 - f) Air Pollution by ships, tankers and non-tankers.
5. Pollution by use of Anti-fouling Paints for ship's hull.
6. Pollution hazards due to discharge of ballast water and its Management.

Part 3: Basic Seamanship

7. Types of ropes and wires used on ships, including their Care & maintenance. Whippings, Knots, Bends & Hitches, splices. Use of lashing gear. Safe Working Load and breaking stress.
8. Cargo lifting gear. Use of blocks, snatch blocks and the differential pulley (chain blocks). Different types of tackles & purchases. Maintenance of various types of blocks, tackles, shackles and bottle-screws/turnbuckles.
9. Mooring arrangements. Use of rope & chain stoppers, mooring shackle. Handling of mooring ropes. Use of slip-ropes. Anchor Work. Parts of a windlass. Cable, Link, Swivel, Joining Shackle, Bitter End. Parts of a stockless anchor. Uses of an anchor, how it is dropped, hoisted and secured.
10. Types of paints, painting procedures and defects. Tools and gear available for maintenance of steel parts of a ship.
11. Magnetic compass points. Steering and helm orders.
12. Personal Safety and Social Responsibilities: Safety Precautions while using pilot ladder, Jacob's ladder, ship's mast, and ropes for climbing. Use of the bosun's chair, staging, helmets, safety belt and safety harness.
13. Personal Survival Techniques. Knowledge of life saving appliances - life jackets, life buoys, gravity davits, lifeboat. Action to take if Man overboard.
14. Fire Prevention and Fire Fighting. Knowledge of fire fighting appliances – extinguishers, hoses, nozzles, fixed fire-fighting systems.
15. Elementary First Aid. Knowledge of the basic elements of first aid.

Books recommended for reference	Author	Publisher	Year/Edn
Seamanship - Theory and Practice	Danton	Routledge	1996 / 11 th Ed
SOLAS – consolidated Edition	IMO	Bhandarkar	2004
MARPOL	IMO	Sterling	2002
International Safety Management Code (ISM)	IMO	ICS	1996/3 rd Ed
International Ships and Ports Security code (ISPS)	IMO	Bhandarkar	2003
Admiralty Manual of Seamanship		HMSO	1983/3rd Ed
IMO Model course (PSSR)	IMO	IMO	
IMO Model course (PST)	IMO	IMO	
IMO Model course (FPFF)	IMO	IMO	
IMO Model course (EFA)	IMO	IMO	

Pattern of Question Paper

First Year B. Sc. Nautical Technology

Basic Ship Operation Technology – Paper I

Duration: 3 hours

Max Marks: 100

Pass marks: 50

Note:

1. Use of non-programmable Scientific calculator, Nories / Burton's Tables, and Graph Paper IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.



University of Mumbai

Institute of Distance Education

Syllabus for

**Second Year
B. Sc. Nautical Technology**

Effective from 2006-2007

Second Year B. Sc. Nautical Technology				
Unit No.	Subject / Paper	Duration of Exam	Max Marks	Pass Marks
1	Applied Terrestrial Navigation Technology – Paper II Part 1 Applied Terrestrial Navigation Part 2 Chart work Practice	3 Hours	100	70
2	Applied Celestial Navigation Technology– Paper II Part 1 Use of Nautical Almanac, Star Charts and Azimuth calculations Part 2 Fixing of Ship's position by means of Observed Position Lines.	3 Hours	100	70
3	Applied Bridge Watchkeeping Technology – Paper II Part 1. Electronic navigation aids, Watch-keeping at Sea and Collision Regulations Part 2. Ship's Weather Observations and Equipment Part 3. Signals and Global Maritime Distress & Safety Systems (GMDSS)	3 Hours	100	50
4	Applied Cargo Handling and Stowage Technology – Paper II Part 1. Cargo Gear, Cargo Handling and Stowage Practical Application Part 2. Oil, Gas and Chemical Tanker Practical Application	3 Hours	100	60
5	Applied Ship Construction and Stability – Paper II Part 1: Applied Ship Construction Part 2: Applied Ship Stability	3 Hours	100	60
6	Applied Ship Operation Technology– Paper II Part 1. Safety systems and equipment Part 2. Marine Pollution Prevention Part 3. Seamanship practice	3 Hours	100	50

Part 1 : Applied Terrestrial Navigation

1. Contents, use of Weekly, Cumulative, Annual Notice to Mariners and Sailing directions, List of Lights, Admiralty List of Radio Signals (ALRS), Tide Tables, Chart Catalogue, Distance Tables, Ocean Passages of the World, Admiralty publications, Guide to port entry,
2. Contents, use and correction procedures for Sailing directions, List of Lights, ALRS, Tide Tables, Chart Catalogue, Distance Tables, Ocean Passages of the World, Admiralty publications, Guide to port entry,
3. Navigation charts - different projections, types, knowledge of symbols used, selection process, correction procedures.
4. Use of deviation tables/card and variation charts.
5. Compass error calculation using various methods and applying to position lines prior plotting on the chart.
6. Calculating times and heights of High Water and Low Water for Standard ports.

Part 2 : Chartwork Practice

7. Practical chart work-plotting positions by running fix, terrestrial/celestial position lines, allowing and counteracting set and drift, calculation of Dead Reckoning (DR), Plotting courses, horizontal/vertical sextant angles
8. International system of Buoyage. - Identifying various types of buoys and their shape, markings, lights and top marks by sight and on chart.
9. Passage planning - principles, use of charts/publications, deviation, no-go areas, under-keel clearance, parallel indexing, abort contingencies, position fixing, additional information
10. Plotting and Transferring great circle / Mercator tracks and distances from Gnomonic to Mercator charts and vice versa.
11. Use of Routeing charts and other reference charts.
12. Calculate Daily Distance travelled since last noon, average speed, course made good, set and drift encountered and Estimated Time of Arrival at next waypoint.

Books recommended for reference	Author	Publisher	Year/Edn
Practical Navigation Plus Nautical Almanac 1992	Capt. H. Subramaniam	Vijaya Publication	4 th Ed / 2004
Nories Nautical Tables	Norie	Blance	1994
Principles of Navigation	Capt. Joseph & Capt. Rewari	ARI	1 st Edition
Chartwork	Capt. S. S. Chaudhary		
Chartwork for Mariners	Capt. S. K. Puri	Marine Pub. Of India	5 th ed / 1993
Voyage/Passage Planning and Chartwork	Capt. M. V. Naik & Capt. Varty		1993
Bridge Team Management	Capt. A. J. Swift	Nautical Institute	2 nd Ed / 2004
Bridge Watchkeeping		Nautical Institute	4 th Ed / 1994
Burton's Nautical Tables	Burton		
Nicholls Concise Guide Vol I & II		Brown & Ferguson	
Admiralty manual of Navigation		HMSO	
Principles and Practice of Navigation		A. Frost	

Pattern of Question Paper

Second Year B. Sc. Nautical Technology

Applied Terrestrial Navigation Technology – Paper II

Duration: 3 hours

Max Marks: 100

Pass marks: 70

Note:

1. Use of Non-scientific calculator, Nories/Burton's Tables, Tide Tables and Nautical Almanac IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Part 1 : Use of Nautical Almanac, Star Charts and Azimuth Calculations.

1. Identifying constellations, stars of various magnitudes using star charts and identifiers.
2. Identifying planets using their Sidereal Hour Angle and declination.
3. Compass Error - Observe, calculate, record and apply compass errors / deviation using azimuth of celestial bodies.
4. Compass Error - Observe, calculate, record and apply compass errors / deviation using amplitude observations of celestial bodies
5. Observation, corrections and calculation of true altitudes of heavenly bodies.
6. Use of Nautical Almanac - Calculating Greenwich Hour Angle (GHA), declination, sunrise, sunset, twilight, moonrise, moonset, meridian passage of celestial bodies.

Part 2 : Fixing Ship's Position by means of Observed Position Lines.

7. Calculation of observed Longitude and Position Line from observed sextant Altitude of the Sun, Moon, stars and planets.
8. Calculating meridian passage time of sun and observed Latitude and Position Line from observed sextant altitude of Sun at Meridian Passage.
9. Calculating ex-meridian limits and observed Latitude and Position Line from observed sextant altitude of Sun at Ex Meridian.
10. Calculation of observed Latitude and Position Line from observed sextant altitude of Polaris.
11. Plotting of celestial position lines. Transfer of position line using run, set and drift between two position lines.
12. Calculation of observed position using multiple observations of heavenly bodies using Intercept method.

Books recommended for reference	Author	Publisher	Year/Edn
Practical Navigation Plus Nautical Almanac 1992	Capt. H. Subramaniam	Vijaya Publication	4 th Ed / 2004
Principles Of Navigation	Capt. Joseph & Capt. Rewari	ARI	1 st Edition
Nories Nautical Tables	Nories	Blance	1994
Burton's Nautical Tables	Burton		3 rd Ed
Admiralty Manual of Navigation Vol I & II	Admiralty	HMSO	1983/3 rd Ed
Nicholls Concise Guide Vol I & II		Brown & Ferguson	

Pattern of Question Paper

Second Year B. Sc. Nautical Technology

Applied Celestial Navigation Technology – Paper II

Duration: 3 hours

Max Marks: 100

Pass marks: 70

Note:

1. Use of Non-scientific calculator, Nories/Burton's Tables, and Nautical Almanac IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Part 1: Electronic Navigation aids, Watch-keeping at Sea and Collision Regulations

1. Compass – Gyro and Magnetic

(a) Gyro Compass - Locate Master and Repeaters, Maintenance, Comparison, Align repeaters, Correct errors, Alarms

(b) Magnetic Compass - Binnacle Construction, Bowl Construction, Periscope Construction, Corrections, Deviation, Graduations and Box compass in points, Remove bubble, and Magnetic compass off course alarm. Effect of ferrous cargo.

2. Sextant - Identify parts, identify and determine corrections, practical uses. Pelorus - practical use. Azimuth Mirror - practical use and maintenance.

3. Steering control system

(a) Steering controls - different modes of steering, various alarms, changing over procedures, helm limits, rudder angle indicator.

(b) Steering Gear - description, operation, maintenance, alarms, change-over procedures, emergency drills, records.

(c) Auto pilot - set-up, change over procedures, off-course/auto-pilot alarms - setup and tests

4. RADAR/Automatic Radar Plotting Aids (ARPA)

(a) RADAR - setup & operate, start/stop precautions, use of various controls, performance monitoring, limitations and errors, Radar logs, methods of position fixing using radar, false echoes, h-up/north-up/course-up/true/relative motion displays, parallel indexing, use of RADAR for anti-collision, manual plots

(b) ARPA - setup & operate, acquire targets, true and relative vectors, use of various controls, performance monitoring, setting up of guard zones, guard rings, alarms, interpretation of data from targets, speed and course inputs

5. Other Instruments

(a) Bridge telegraphs- use and testing.

(b) Course recorder - setup & operate, synchronize, routine markings, maintenance

- (c) Echo sounder - setup & operate, routine markings, maintenance, zero/draft adjustment, compare with chart
 - (d) Sound / Light signalling appliances - (Main / Emergency) setup & operate Aldis lamp, Morse lamp, air/electric whistle, foghorn, gong, bell and their use in collision avoidance
 - (e) Global Positioning System (GPS)/ Differential GPS - setup & operate, use of various features, errors and limitations, set waypoints, event markers, alarms,
 - (f) Log Electro-magnetic / Doppler - setup & operate in different modes
 - (g) Weather Fax - setup & operate using ALRS , use of weather charts, knowledge of symbols
 - (h) Navigation Lights - maintenance and switch over procedures, alarms
 - (i) Chronometers - maintenance, taking of error with time signals, recording error and daily variance, use when taking sights.
6. Watch-keeping at Sea
- (a) Look out duties
 - (b) Handing over / Taking over Navigational watch at sea / Anchorage / In Port, Rest hours
 - (c) Checking of fixes at sea , Anchor
 - (d) Altering course – precautions, procedures, informing master
 - (e) Departure / Arrival Checklists and preparations , control testing
 - (f) Precautions and use of checklists at sea , during reduced visibility, App port, Dep port, Heavy weather, Ice areas, darkness, dense traffic, Traffic separation schemes.
 - (g) Log book, movement book and other log entries
 - (h) Preparing for arrival port / anchorage, departure port / anchorage, picking up pilot, disembarking pilot.
 - (i) Company/master's Standing orders, night orders, calling master, Regulations regarding Watch-keeping duties.
 - (j) Knowledge and practical application of Collision Regulations, sound signals, lights & shapes
 - (k) Hand steering practice - by day, by night, by sight, entering and leaving port

Part 2. Ship's Weather Observations and Equipment

7. Instruments - use , maintain, and interpret information from
 - (a) Aneroid barometer, barographs, air and sea thermometers, hygrometers, psychrometers, anemometers,
8. Weather observations
 - (a) Sea state / wind-force charts - knowledge of Beaufort scale, interpretation of sea state from wind/waves
 - (b) Cloud atlas - knowledge of various cloud types, cloud cover, weather associated with various clouds
 - (c) Meteorological observations and reports - make & interpret weather report using weather code
 - (d) Weather observations in deck log book - observe and record
 - (e) Weather Fax charts - types of charts, knowledge of signs and symbols,
 - (f) Weather patterns and Barometer trends - how to observe and interpret
 - (g) Weather information from charts / publications - how to read weather routing charts, Sailing directions
 - (h) Tropical Revolving Storms (TRS) - Bay of Bengal's law, impending signs, avoiding action, precautions

Part 3. Signals and GMDSS

9. Signals
 - (a) Standard Marine Communication Phrases - use in all modes of communication (Radio/verbal/written)
 - (b) Morse signalling - knowledge of Morse code, ability to transmit and receive.
 - (c) Use of International Code of Signals (INTERCO) - knowledge of flags A-Z, 0-9 and interpret single hoists of International code flags
10. Flag etiquette - National Flags, ensigns, house flag, Courtesy flag. Procedure for "Dress ship" and exchange of courtesies with others Procedure to adopt when saluting, under mourning/half mast. Maintenance and repair of flags
11. Distress Signals - types, action for each, procedures to follow
12. Ship's Reporting systems & drafting of messages
13. GMDSS / Communication equipment

- (a) Telephones , Emergency Telephone, Loud Hailers, Walkie Talkies - use and maintenance
- (b) GMDSS – Very High Frequency (VHF), Medium Frequency (MF), High Frequency (HF), International Maritime Satellite System (INMARSAT), Navigation Text Message (NAVTEX), Walkie Talkies, SART, EPIRB, batteries - setup & operate, routine maintenance, operational tests, log entries,

Books recommended for reference	Author	Publisher	Year/Edn
Marine Meteorology Plus Ship's Weather Code	Capt. H. Subramaniam	Vijaya Publication	2002 / 3 rd Ed
Nautical Watchkeeping	Capt. H. Subramaniam	Vijaya Publication	2001 / 2 nd Ed
Shipborne Radar and ARPA	Capt. H. Subramaniam	Vijaya Publication	2001 / 3 rd Ed
Regs For Prevention Of Collisions At Sea (Rules Of The Road)	Bhandarkar	Bhandarkar Publications	
Nories Nautical Tables	Norie	Blance	1994
Bridge Equipment & Watchkeeping	Capt. E. Fernandes	Pro-Navigator	
ROR Set Of Cards	Bhandarkar Publications		
Bridge Team Management	Capt. A. J. Swift	Nautical Institute	2 nd Ed / 2004
Bridge Watchkeeping		Nautical Institute	4 th Ed / 1994
Watchkeeping Safety & Cargo Mgmt in Port	Capt. Peter Roberts	Nautical Institute	1 st Ed / 2005
Burton's Nautical Tables	Burton		3 rd Ed
A Guide to Collision Avoidance Rules	Cockraft and Lameijer	Elsevier	6 th Ed / 2004
Radar & ARPA Manual	A. G. Bole and W.O. Dineley		
Radar & Electronic Navigation	G. J. Sonnen berg	Newnes- Butterworths	1963 / 3 rd Ed
GMDSS Handbook	Clifford Merchant		
Meteorology for Mariners	UK Meteorology office	Mct. office	1978/3rd Ed

Pattern of Question Paper

Second Year B. Sc. Nautical Technology

Applied Bridge Watch-Keeping Technology – Paper II

Duration: 3 hours

Max Marks: 100

Pass marks: 50

Note:

1. Use of non-programmable scientific calculator, Nories/Burton's Tables, and Ship's weather code IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.



Unit No. 4

APPLIED CARGO HANDLING AND STOWAGE TECHNOLOGY – PAPER II

Duration: 3 Hours

Max. Marks 100

Pass Marks:60

Part 1: Cargo Gear, Cargo Handling and Stowage – Practical Application

1. Cargo Gear

- (a) Cargo gear inspection, maintenance and overhaul - changing of wires, criteria for rejection, markings, planned maintenance, calculation of Breaking Stress, and Safe Working Load of ropes, wires, chains.
- (b) Cargo gear operation - derricks, Jumbo derricks, Cranes, gantries - rigging, gemini operation, union purchase, safety precautions, hand signals
- (c) Chain register - contents, requirements, rigging plan, certificates

2. Cargo care

- (a) Securing cargo - types and methods of lashing, inspections, tommying, lashing equipment, requirements
- (b) Cargo loading, discharging - procedures and precautions prior and during load/discharge operations, entries in logbook, requirements,
- (c) Stowage plan - making, load density, stowage factor, separation, markings, port rotation. Ensure loading as per stowage plan
- (d) Ventilation of cargo - requirements, natural and forced systems, logbook entries, restricting and allowing ventilation, dew point calculation

3. Preparation & Inspections

- (a) Hold preparation for general cargo, bulk cargo, liquid cargo, dangerous cargoes in bulk on different types of ships, use of different types of dunnage
- (b) Checking fitness of various cargoes prior loading

4. Other operations and precautions

- (a) Reading drafts, calculating cargo, ballast, constants, draft survey, water density
- (b) Load lines - knowledge of types, statutory requirements and compliance, load line zones,
- (c) Marine Safety Data Sheets (MSDS) for cargoes - information gleaned, requirements



- (d) International Maritime Dangerous Goods (IMDG) Code, Timber Code and Bulk Codes
- (e) Watch-keeping in port

Part 2. Oil, Gas and Chemical Tanker Practical Application

5. Watch-keeping in port

- (a) Duties of OOW
- (b) Duties at manifold
- (c) Duties of Fire patrol

6. Procedures

- (a) Various cargo tank operations - Loading, Discharging, Tank cleaning, COW, inerting.
- (b) Taking ullages, interphase, temp, densities - instruments and precautions
- (c) Procedure for inerting a cargo tank on an LPG Carrier
- (d) Purging, cooling and loading LPG.
- (e) Operation of Re-liquefaction plant.
- (f) Loading/discharging cargo on an LPG Carrier.
- (g) Warming, drying and aeration of LPG cargo spaces.
- (h) Operation of a Deep Well Cargo Pump.
- (i) Precautions to be taken when loading/discharging cryogenic cargoes

7. Inspections

- (a) Pump-room inspection and entry procedures, ventilation requirements
- (b) Monitoring void spaces

8. Equipment and systems

- (a) Inert Gas Systems - description, operation, precautions, monitoring, alarms
- (b) Cargo and Ballast pipelines and pumping systems - description, operation and setting up for ballast/deballast/load/discharge, start/stop procedures, emergency stop systems.
- (c) Venting systems -description and construction of PV valves/breakers, HV valves. Precautions for over/under pressurisation of tanks, vapour recovery systems
- (d) Cargo heating systems - description, operation, precautions, monitoring

9. Cargo segregation methods

10. Monitoring Instruments: Instruments - portable and fixed Gas/oxygen monitoring

11. Cargo calculations

(a) Use of ASTM, calibration tables. Conversion of observed volume into weight of cargo loaded

(b) Calculation of Cargo quantity taking into account liquid + vapour (LPG tankers)

12. Tanker publications – International Safety Guide for Oil Tankers and Terminals (ISGOTT), Clean seas guide, Tanker Operations Manual.

Books recommended for reference	Author	Publisher	Year/Edn
Cargo Work	Capt. E. Fernandes	Mairtinez Enterprises	1993/1 st Ed
Seamanship - Theory and Practice	Graham Danton	Routledge	1996/11th Ed
Watchkeeping Safety & Cargo Mgmt in Port	Capt. Peter Roberts	Nautical Institute	2005 / 1 st Ed
Tanker Operations – A Handbook for Ship's officers	G.S.Marton	Cornell Maritime Press	1992/3 rd Ed.
ISGOTT	OCIMF	Witherby	1996/4 th Ed.
Clean Seas Guide	ICS	Witherby	1994/4 th Ed
MARPOL		IMO	2002
Tanker Safety Guide	ICS	Witherby	
Cargo Work	Capt. L. G. Taylor	Brown sons & Ferguson Ltd	1992/12 th Ed
Notes on Cargo Work	Kemp & Young	Standford Maritime	1980/1 st Ed
Safe Tanker Operation	Capt. K. Mistree & B. K. Sharma	Marinez Enterprises	2001 / 4 th Ed

Pattern of Question Paper

Second Year B. Sc. Nautical Technology

Applied Cargo Handling and Stowage Technology – Paper II

Duration: 3 hours

Max Marks: 100

Pass marks: 60

Note:

1. Use of non-programmable scientific calculator, Nories/Burton's Tables, ASTM Tables and Graph Paper IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Q.9.

Unit No. 5

APPLIED SHIP CONSTRUCTION AND STABILITY – PAPER II

Duration: 3 Hours

Max. Marks 100

Pass Marks: 60

Part 1: Applied Ship Construction

1. Hatchcover operation, maintenance, inspections.
2. Deck plan of air pipes, filling pipes, sounding pipes, temperature pipes, ventilators, other openings, and their closing arrangement. Layout of the tanks / holds and the location of Bilges and Bilge pumping system.
3. Different types of structural joints/connections to the hull, deck, bulkheads and other members of the ship. Difference between weather tight and water tight doors
4. Maintenance/renewal of different types of packing and its holding arrangement, studs, bolts, clamps. Testing water tight compartments with hydraulic or Air pressure
5. Preparation for inspection/survey of inner/external part of hull.
6. Corrosion protection systems, paints, sacrificial anodes and impressed current systems
7. Drydocking - preparation, procedure, precautions, inspections and surveys. Check Docking plan and any specific features on the bottom hull which may need attention/free of keel blocks
8. Anchor cable markings, ranging cables, inspection. Chain locker and "Bitter end" fastening arrangement
9. Overhaul and inspection of all overboard valves including high and low sea chests

Part 2: Applied Ship Stability

10. Calculation of Metacentric height of the ship in a given condition
11. Effect of slack tanks on the Metacentric height of the ship
12. Effect of loading and discharging, shifting weights, taking in ballast and deballasting on the stability of the vessel
13. List: Calculation of angle of list.
14. Docking condition in the stability booklet and identify the docking trim.



Books recommended for reference	Author	Publisher	Year/Edn
Ship Stability I	Capt. H. Subramaniam	Vijay Publication	1981/1st Ed
Ship Construction	Kemp & Young	Elsevier India	1 st Ed/2003
M. V. HINDSHIP	Capt. Joseph & Capt. Rewari	ARI	2002/3rd Ed
HINDSHIP Tables	Capt. Joseph & Capt. Rewari	Bhandarkar	
Ship construction	E. J. Eyres	Elsevier India	1 st Ed/2003
Ship Stability for Masters and Mates	D. R. Derretts.	Butterworth Heinemann	1999/5th Ed.
Ship Stability	I.C. CLARK	Nautical Institute	2002/1 st Ed

Pattern of Question Paper

Second Year B. Sc. Nautical Technology

Applied Ship Construction and Stability – Paper II

Duration: 3 hours

Max Marks: 100

Pass marks: 60

Note:

1. Use of non-programmable scientific calculator, Nories/Burton's Tables, Hindship Tables, and Graph paper IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

Part 1. Safety systems and equipment

1. Safety Management systems

- (a) Company's Safety Policy, Ship Master's Policy on safety aboard the ship and how to achieve it.
- (b) Emergency situations as listed in the Emergency Contingency Plan (ECP) - understanding, duties of the OOW on the bridge under each. Maintain time log

2. General Safety procedures

- (a) Distress or emergency signals - recognise and action to be taken
- (b) Bunkering procedure, preparation and precautions
- (c) Stowaways - search, precautions to avoid, procedure when dealing with stowaways and refugees, checklist and IMO guidelines
- (d) Emergency / Abandon ship muster lists - preparation and delegation of duties
- (e) Knowledge of safety information, symbols, signs, Emergency Escape and alarms in use for Emergency Muster Stations, Abandon Ship Stations and Man overboard
- (f) Emergency Drills - practice, participate, precautions, procedure, record
- (g) Precautions to be taken when: (1) Entering enclosed space (2) Working aloft (3) Working over side (4) Carrying out Hot work

3. Life Saving Appliances

- (a) Life Saving Appliances - layout, requirements, maintenance, operation, precautions, records,
- (b) Self Contained Breathing Apparatus (SCBA), Emergency Life Saving Appliances (ELSA), Emergency Escape Breathing device (EEBD) - use, operation, maintenance and precautions
- (c) Life-rafts and Buoyant Apparatus - releasing arrangement, launching/recovery procedure, float free system - maintenance, operation, precautions, records
- (d) Lifeboats - releasing arrangement, launching/recovery procedure - maintenance, operation, precautions, records, equipment, provisions. Lifeboat winches and their operation. Sprinkler and air supply systems. Changing falls end to end

- (e) Pyrotechnics & Line Throwing Apparatus - maintenance, operation, precautions, disposal procedure and records
 - (f) Lifeboat & Rescue boat davits, Life raft launching gear - lubrication and maintenance of davit blocks, pulleys, shackles, bottle screws and pins, limit switches
 - (g) Life-Jackets, Life-buoys, Immersion Suits & Thermal Protective Aids - requirements, use, care and maintenance
4. Fire Fighting Appliances
- (a) Fire Fighting Appliances - layout, requirements, maintenance, operation, precautions, records,
 - (b) Types of fire, common features, and planned strategy for extinguishing fires as stated in the Shipboard Contingency Plan.
 - (c) Fire and smoke detection equipment - operational procedures, testing, maintenance plans
 - (d) Smothering and automatic sprinkler systems - description, operational procedures, testing, maintenance
 - (e) Fire flaps, fire dampers, automatic/manual fire prevention door, watertight doors, - description, operational procedures, testing, maintenance
5. Surveys, Inspections, Documentation
- (a) Preparing vessel for Vetting Inspections, Port State and Statutory Survey Inspections
 - (b) Statutory trading certificates - identify contents of each
6. Other Safety Equipment and procedures
- (a) Quick closing valves, Emergency stop mechanism for main engines, auxiliary engines, boiler feed and fuels pumps - description, operational procedures, testing, maintenance
 - (b) International Aeronautical and Maritime Search and Rescue (IAMSAR) - procedures, search methods
 - (c) Man Overboard - precautions, knowledge of basic procedures
 - (d) Emergency Position Indicating Radio Beacon (EPIRB), Search and Rescue Transponder (SART) & GMDSS Survival Craft Walkie-Talkies - maintenance, operation, precautions, records
 - (e) Helicopter rescue operations - preparation, procedure and precautions, ICS guidelines
 - (f) Enclosed Space entry, Hot/cold work permits - requirements, preparation, checklist, precautions..

- (g) Personal Protective Gear - usage in relation to specific hazards
- (h) Emergency Fire Pump - requirements, operations, maintenance
- (i) Emergency generator - requirements, operations, maintenance

7. Medical

- (a) Ships captains medical guide - contents and use
- (b) Medical locker, poison locker - contents (stretcher, resuscitator etc), inventory and maintenance
- (c) First aid party during drills - duties and responsibilities
- (d) Radio Medical advice by Satcom/Telex/Fax/Email - procedure and checklist
- (e) Heat stroke, Electric shock, Shock, Hypothermia, fracture, bleeding, burns - prevention, first aid procedures and treatment

Part 2. Practical Marine Pollution Prevention

8. Legislations and record keeping

- (a) Preventing of pollution by oil into the sea.
- (b) Preventing of pollution by sewage and Garbage into the sea.
- (c) Preventing of pollution by Noxious liquid substance carried in bulk into the sea.
- (d) Preventing pollution by Hazardous cargoes carried in packaging or containers into the sea.
- (e) Basic requirements of International Convention for prevention of Marine Pollution (MARPOL) 73/78 and the importance and proper up keep of various records.
- (f) Ballast Water Management at Sea.

9. Procedures, Equipment, Documentation

- (a) Ballasting/Deballasting. Precautions to be taken when running up tanks (ballasting) or pumping out the same.
- (b) Shipboard Oil Pollution Emergency Plan (SOPEP Manual)
- (c) Pollution control equipment, SOPEP locker maintenance and usage of equipment
- (d) Oil Discharge Monitoring and Control System (ODMCS) - operation and testing
- (e) Cargo Tank High-level alarm system & pump room Bilge High Level Alarm - operation and testing

Part 3. Seamanship practice

10. Mooring / Anchoring operations and equipment

- (a) Anchoring, berthing, unberthing procedures and precautions
- (b) Using windlass and other mooring equipment
- (c) Mooring and unmooring a ship

11. Routine operations

- (a) Calculating ballast and fresh water from tank calibration tables, list and trim corrections, procedure and precautions while taking soundings, ullage, use of different sounding methods
- (b) Reading draft marks and load lines, load line batten
- (c) Inventory of the Deck stores, Consumables, Condemned stores both for deck and other divisions
- (d) Rigging staging, Boatswains chair, inspect condition of staging ropes and life lines
- (e) Gangway duty - recording, responsibility, tending moorings/gangway, gangway net.

12. Corrosion control, Surface preparation and Paint systems

- (a) Importance of De-scaling, Scrapping, wire brushing before applying primer and final coat of paint. Special attention for removing soluble crystallised salts prior painting.
- (b) Corrosion cycle - understanding and prevention
- (c) Procedure for rigging the pilot ladder, including Manropes.
- (d) Different types of paints, area specific paints.
- (e) Surface preparation requirements for different paints
- (f) Re-coating requirements for different paints
- (g) Precautions to be exercised when painting. Defects in painted surfaces such as fading, flaking, blistering, cracks, discoloration, non-drying, etc. Knowledge of properties of primers, Under Water paints, epoxy, synthetic resins and chlorinated rubber paints. The advantages and procedure of application for each type of paint listed above.

13. Miscellaneous

- (a) Practical knowledge and Use of various knots, bends & splices including back splice, eye splice, long splice, short splice, locking splice, Liverpool splice, etc.
- (b) Read and Interpret Ship's plans : Gen Arrangement, Safety Equipment, Bilge pumping out arrangement, Sounding pipes, Mooring arrangement, Cargo hold/tank layout & cargo piping.



Books recommended for reference	Author	Publisher	Year/Edn
Seamanship - Theory and Practice	Graham Danton	Routledge	1996/11th Ed
Seamanship	D. J. House		1987/1 st Ed
Manual of Seamanship	Admiralty	HMSO	1983/3 rd Ed
Seamanship Primer	Capt. J. Dinger	Bhandarkar	
Code of Safe Working Practices for Merchant Seamen		HMSO	1998
SOLAS – consolidated Edition	IMO	Bhandarkar	2004
MARPOL		IMO	2002
International Safety Management Code (ISM)	IMO	ICS	1996/3 rd Ed
International Ships and Parts Security code (ISPS)	IMO	Bhandarkar	2003
LSS Code	IMO		
FSS Code	IMO		
SOLAS Training Manual	Kelvin Hughes	I. C. Brindle & Co.	1995

Pattern of Question Paper

Second Year B. Sc. Nautical Technology

Applied Ship Operation Technology – Paper II

Duration: 3 hours

Max Marks: 100

Pass marks: 50

Note:

1. Use of non-programmable Scientific calculator, Nories/Burton's Tables, and Graph Paper IS PERMITTED
2. Attempt any TWO questions from Section 1 and any THREE questions from Section 2, a total of FIVE questions. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

Q.2.

Q.3.

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

Q.8.

University of Mumbai

Institute of Distance Education

Syllabus for

Third Year B. Sc. Nautical Technology

Effective from 2007-2008

B.Sc. Nautical Technology- Third Year

Unit No.	Subject/Title	Duration of Examination	Maximum Marks	Pass Marks
1	Terrestrial Navigation Technology – Paper III Part 1: Terrestrial Navigation Part 2: Exercises in Chart Work	3 Hours	100	70
2	Celestial Navigation Technology – Paper III Part 1: Celestial Navigation Part 2: Calculations in Celestial Navigation	3 Hours	100	70
3	Bridge Watch-keeping Technology – Paper III Part 1 : Electronic Navigational Equipment Part 2: Ship's Weather Observations and Instruments Part 3: Watch-keeping Technology	3 Hours	100	50
4	Cargo Handling and Stowage Technology – Paper III	3 Hours	100	60
5	Ship Construction and Stability – Paper III Part 1: Ship Construction Part 2: Ship Stability	3 Hours	100	60
6	Ship Operation Technology – Paper III Part 1: Safety and Maritime Legislation Part 2: Pollution Prevention Part 3: Seamanship Practices	3 Hours	100	50

TERRESTRIAL NAVIGATION TECHNOLOGY - PAPER III

Duration of Exam: 3 Hours

Max. Marks: 100

Pass Marks: 70

PART 1: – TERRESTRIAL NAVIGATION

1. **Definitions:** Earth, great circle, spherical triangle, earth's axis, poles, equator, meridians, latitude, parallels of latitude, prime meridian, longitude, difference of latitude and difference of longitude, compression, geographic mile, statute mile, kilometre, nautical mile, cable and knot.
2. **Datums:** Rotation of the earth about its axis. Origin and directions of the co-ordinate system for earth's surface. Units of measurement. Directions by gyrocompass, magnetic compass.
3. **Compass corrections:** Deviation, Variation, and compass error. Error of Gyro compass
4. **Distances:** Measurement of distance between two positions on a Mercator's projection navigational chart.
5. **Position lines and positions:** Definition of a position, finding the position by range and bearings.
6. **Plane and Mercator Sailings:** Departure, d'lat and distance relationship, true course, rhumb line, parallel sailing formula, distance between two positions, use of traverse table, Mercator sailing.
7. **Great and Composite Circle Sailings:** Calculation of initial course, final course, distance and position of Vortex along a great circle track. Limitation of latitude and Composite Circle sailing.
8. **Keeping a log:** Procedures for keeping log during ocean passages, coastal navigation and at anchor.

PART 2: EXERCISES IN CHART WORK

9. **Navigational Charts:** Natural scale, Meridional parts, chart catalogue, and Gnomonic charts, plan charts, Mercator charts. Notices to mariners.
10. **Electronic (Navigational) Chart Display and Information System (ECDIS):** ECDIS and other electronic navigational chart systems meeting the performance standards set by International Maritime Organisation (IMO) as a substitute for traditional navigational charts. Familiarisation with the ship's electronic navigational chart equipment and its controls.

11. **Information from charts and Nautical Publications:** Information from charts, Lists of lights and other publications: Publication 5011, IALA system of buoyage, raising/dipping, first/last sighting distances, use of lattice charts, passage planning.
12. **Exercises in Passage Planning using Navigational Charts:** Allowing and counteracting current and leeway, tidal stream, running fix, three point bearing, horizontal and vertical sextant angles, finding out actual set and rate of current.
13. **Tides:** Tide tables, Range, duration of tide, height of tide, spring and neap tides, standard and secondary port, tide calculations, heights for intermediate times & visa-versa.

Books recommended for reference	Author	Publisher	Year/Edn
Practical Navigation Plus Nautical Almanac 1992	Capt. H. Subramaniam	Vijaya Publication	4 th Ed / 2004
Nories Nautical Tables	Norie	Blance	1994
Principles of Navigation	Capt. Joseph & Capt. Rewari	ARI	1 st Edition
Chartwork	Capt. S. S. Chaudhary		
Chartwork for Mariners	Capt. S. K. Puri	Marine Pub. Of India	5 th ed / 1993
Voyage/Passage Planning and Chartwork	Capt. M. V. Naik & Capt. Varty	-	1993
Bridge Team Management	Capt. A. J. Swift	Nautical Institute	2 nd Ed / 2004
Bridge Watchkeeping		Nautical Institute	4 th Ed / 1994
Burton's Nautical Tables	Burton		
Nicholls Concise Guide Vol I & II		Brown & Ferguson	
Admiralty Manual of Navigation		HMSO	
Principles and Practice of Navigation		A. Frost	

Pattern of Question Paper

Third Year B. Sc. Nautical Technology

Terrestrial Navigation Technology – Paper III

Duration: 3 hours

Max Marks: 100

Pass marks: 70

Note:

1. Use of Non-scientific calculator, Nories/Burton's nautical tables, and Nautical Almanac IS PERMITTED
2. Attempt any TWO questions from Section 1 and THREE questions from Section 2. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

(a)

(b)

Q.2.

(a)

(b)

Q.3.

(a)

(b)

Section 2: Chart No. _____ (Supplied)

Q.4.

Q.5.

Q.6.

Q.7.

CELESTIAL NAVIGATION TECHNOLOGY – PAPER III

Duration of Exam: 3 Hours

Max. Marks: 100

Pass Marks: 70

PART 1: PRINCIPLES OF CELESTIAL NAVIGATION

Solar system: Celestial pole, perihelion and aphelion, Kepler's laws of planetary motion, solstices and equinoxes, SHA, Declination of bodies, twilights, earth-moon system, solar and lunar eclipses.

Celestial sphere and equinoctial system of co-ordinates: Celestial sphere, celestial poles, celestial meridians, equinoctial, and obliquity of ecliptic. Nautical Almanac.

Hour angle: GHA, LHA, SHA, 'd' or 'v' corrections, right ascension.

Daily motion and horizontal system of co-ordinates: Rational horizon, zenith, nadir, vertical circle, elevated pole, depressed pole, true altitude, azimuth, true zenith distance, PZX triangle, and circumpolar bodies.

Sextant and altitude corrections: Reading a sextant, index error, visible, sensible and rational horizons, true altitude, observed altitude, dip, refraction, semi-diameter and parallax, back angle observations.

Amplitude: Theoretical and visible sunrise and sunset, calculation of true amplitude.

Time and equation of time: Relationship between LHA (sun) and LAT, mean solar day, dynamical mean sun, equation of time, GMT, LMT and longitude relationship, zone and standard times, time signals, precession and nutation, sidereal, tropical, anomalistic and civil years.

Nautical Almanac: Information in Nautical Almanac and using it for celestial observations.

PART 2: CALCULATIONS IN CELESTIAL NAVIGATION

Latitude by meridian altitude: Calculation of latitude by meridian altitude, circumpolar bodies, direction of position line at the time of taking meridian altitude

Pole Star observations: Identification of Polaris, a_0 , a_1 , a_2 corrections and calculation of azimuth and position line & a position through which it passes.

Long by chron method of calculation of sights and position fixing

Intercept (Marcq St. Hilaire) method for obtaining position lines

Ex-meridian method of calculation of sights.

Position fixing by simultaneous & staggered observations.

Errors of compasses – True Azimuth of a body: Calculation of magnetic compass and gyro compass errors by observing heavenly bodies by using ABC tables.

Books recommended for reference	Author	Publisher	Year/Edn
Practical Navigation Plus Nautical Almanac 1992	Capt. H. Subramaniam	Vijaya Publication	4 th Ed / 2004
Principles Of Navigation	Capt. Joseph & Capt. Rewari	ARI	1 st Edition
Nories Nautical Tables	Nories	Blance	1994
Burton's Nautical Tables	Burton		3 rd Ed
Admiralty Manual of Navigation Vol I & II	Admiralty	HMSO	1983/3 rd Ed
Nicholls Concise Guide Vol I & II		Brown & Ferguson	

Pattern of Question Paper

Third Year B. Sc. Nautical Technology

Celestial Navigation Technology – Paper III

Duration: 3 hours

Max Marks: 100

Pass marks: 70

Note:

1. Use of Non-scientific calculator, Nories/Burton's nautical tables, and Nautical Almanac IS PERMITTED
2. Attempt any TWO questions from Section 1 and THREE questions from Section 2. All questions carry EQUAL marks.
3. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Section 1:

Q.1.

(a)

(b)

Q.2.

(a)

(b)

Q.3.

(a)

(b)

Section 2:

Q.4.

Q.5.

Q.6.

Q.7.

BRIDGE WATCH-KEEPING TECHNOLOGY – PAPER III

Duration of Exam: 3 Hours

Max. Marks: 100

Pass Marks: 50

PART 1: – ELECTRONIC NAVIGATIONAL EQUIPMENT

1. Electronic Systems of Position Fixing

- (a) Basic principles of hyperbolic navigation system: Hyperbola, principles of the hyperbolae, combining hyperbolic patterns to ascertain positions.
- (b) Global Positioning System (GPS): Basic principle and errors of GPS system. Differential GPS.
- (c) Automatic Identification System.

2. Echo-sounders and Speed Measurement

- (a) Echo sounders: Basic principle, block diagram, operation and errors of echo sounder.
- (b) Speed log: Basic principle of Electro magnetic log, pressure tube, acoustic correlation and Doppler speed logs, Janus configuration.

3. Compass – Magnetic and gyro

- (a) The magnetism of the earth and the ship's deviation: Simple magnet, magnetic field, flux density, field strength, hard and soft iron, intensity of magnetisation, permeability, magnetic susceptibility, magnetic poles, magnetic equator, angle of dip.
- (b) The magnetic compass: Liquid card magnetic compass, deviation, and lubber line, compass error.
- (c) The gyro-compass: Free gyroscope, gyroscopic inertia and precession, tilt & drift, damping, North seeking ability of gyro compass, errors of gyro, calculation of gyro error.

4. Steering control systems: Knowledge of steering control systems, operational procedures, and change over from manual to auto and vice-versa, adjustment of controls for optimum performance. The automatic pilot: Principle, functions, auto pilot alarm, the performance standards for automatic pilot.

5. Use of Radar and ARPA to maintain safety of navigation

- (a) **Setting Up and Maintaining Displays:** Function and adjustment of controls: Transmitter controls, reception controls, display controls, different types of displays, performance monitor. Measurement of range & bearing: Range & bearing accuracy, error in range & bearing, Performance standards for radar equipment
- (b) **Plotting**
 - The relative motion triangle: Drawing of relative motion triangle and identification of various vectors and angles.
 - Plotting devices: Drawing the relative motion triangle on a plotting chart, manoeuvring board and reflection plotter.
 - Course, speed and aspect of other ships in relative and true presentation.

- Closest point of approach (CPA) and time to closest point of approach (TCPA) in relative and true presentation.
 - The effect of course and speed changes on the display: Advantage of compass stabilisation of a relative display.
 - Standardised report format and reporting procedures: Elements of the two parts of a report (bearing and drawing, range and change, CPA, TCPA, course or aspect, speed)
- (c) **The Use of Radar in Navigation and COLREG 1972**
- The use of radar for position fixing: Obtaining position fix by radar bearing and range, possible errors, position fixed by two or more radar ranges. Reliability. Aids to radar navigation: Use of passive and active aids, RACONs and SARTs.
 - The use of parallel indexing technique in radar navigation: Reflection plotter, wheel over positions and safety margins.
 - The relationship of COLREG 1972 to the use of radar: Lookout, Safe speed, plotting of targets and actions to be taken to avoid collision in clear and bad visibility conditions.
- (d) **ARPA Systems: Vectors (relative and true), digital read-out, potential points of collision, predicted areas of danger. Risks of Over-reliance on ARPA.**
- (e) **IMO Performance Standards for Automatic Radar Plotting Aids (ARPA):** Requirements for acquisition and tracking of targets, operation warnings, gyro and log inputs.
- (f) **Features of ARPA:** Manual and automatic acquisition of targets, pre-set guard ring, Principle of tracking by ARPA, target swop. The reason for delay in display. Optimum display of echoes, use of echo referencing in the true motion mode. Graphic display of PPCs and PADs, results of trial manoeuvres, benefits and limitations of operational warnings. Lost target, incorrect interpretation for ARPA. Errors in bearing by backlash, ship motion, asymmetrical antenna beam, azimuth quantization, error range by rolling of "own ship", range quantization, effects of heading and speed errors on derived information. Critical targets, relative and true course and speed of target, CPA and TCPA targets. Analysis of displayed situations, determine and execute action to avoid close quarters situations. **Ground stabilisation:** Errors involved

PART 2: – SHIP'S WEATHER OBSERVATIONS AND INSTRUMENTS

1. The Meteorological Elements

- (a) Shipborne meteorological instruments: Mercury barometer, aneroid barometer, thermometer, hygrometer, Stevenson's Screen, Whirling Psychrometer and wind sensors. Weather Fax
- (b) The atmosphere, its composition and physical properties: Troposphere, tropopause, stratosphere, stratopause, mesosphere, mesopause, thermosphere, insolation, water vapour, evaporation, condensation, latent heat, dewpoint, absolute humidity, relative humidity, vapour pressure.
- (c) Atmospheric pressure: Definition of pressure, change of pressure with height, average pressure, and isobar.
- (d) Wind: Beaufort scale of wind force, pressure gradient force, Coriolis force, Buys-Ballot's Law, apparent and true wind.

- (e) Cloud and precipitation: Formation of clouds, different types of clouds, classification of clouds as per height, precipitation, drizzle, hail, snow, sleet.
 - (f) Visibility: Formation of fog, mist and haze, different types of fog, effect of fog mist and haze and other meteorological conditions on visibility.
 - (g) Climatology: The wind and pressure systems over the oceans: Mean surface pressure and wind distribution, doldrums, inter-tropical convergency zones, westerlies, polar easterlies, monsoon, land and sea breeze, anabatic and katabatic winds.
2. **Weather Systems** - Structure of depressions: Air mass, source region, warm front, cold front, depression, family of depressions. Anticyclones and other pressure systems: Anticyclone, ridge, col.
 3. **Weather Reports and Forecasting** - Weather services for shipping: World Meteorological Organisation, weather information available to shipping, meteorological offices, facsimile machine. Recording and reporting weather observations: Meteorological codes, coding and decoding of weather messages. Weather forecasting: Interpretation of symbols and isobaric patterns on weather charts and facsimile charts.

PART 3: – WATCH-KEEPING TECHNOLOGY

1. Watch-keeping Arrangements and Procedures

- (a) The content, application and intent of COLREG 72: Rules 1 to 38
- (b) Keeping a safe navigational watch: Principles observed in keeping safe navigational watch, Relieving of duties, procedure of taking over watches, action on receiving storm warning, entries in logbook.
- (c) Keeping an effective anchor watch in port under normal circumstances: Relieving of duties, procedure of taking over watches, action on receiving storm warning, entries in logbook.
- (d) Thorough knowledge of effective bridge team work procedures
- (e) The use of routeing in accordance with the General Provisions on Ship's Routeing

2. Respond to emergencies

- (a) **Contingency Planning:** Contingency plans for response to emergencies: Contents of muster list, remote control operations, command team, emergency team, back-up team and engine room team, need of good communication, actions taken in various emergencies.
- (b) **Measures which should be taken in emergencies for the protection and safety of the ship, passengers and crew**
 - Precautions to be taken when beaching a vessel: Circumstances when the vessel can be beached, procedure of beaching.
 - Actions to be taken on stranding: Initial damage, assessment and control, sounding of compartments, use of ground tackle.
 - Actions to be taken following a collision: Initial damage, assessment and control, stoppage of engine, repairing lifeboat, distress or urgency signal.
 - Precautions for the protection and safety of passengers in emergency situations: Warning the passengers, evacuating all passengers, taking a roll call, instructing passengers during drills and supply of blankets.

- Means of limiting damage and salving the ship following a fire or explosion: Cooling of compartment boundaries, inspection for damage.
 - Procedure for abandoning ship: Transmission of distress call and until acknowledged, extra food and blanket, emergency radio, warm clothing and lifejackets, launching in heavy weather, use of rocket line-throwing appliances and breeches buoy.
 - Use of auxiliary steering gear and the rigging and use of jury steering arrangements: Arrangement of auxiliary steering gear, securing the rudder in the event of a broken rudder stock, constructing a jury rudder.
 - Arrangements for towing and being taken in tow: Towing gears on board ship, method of towing disabled methods, communication between two ships.
 - Rescue of persons from sea or from a vessel in distress: Use of oil in rough weather, waiting for day light, providing a lee, method of rescue when sea conditions are too dangerous to use boat.
3. **Respond to a distress signal at sea**
- (a) **Measures for assisting a vessel in distress:** Contents of IAMSAR, various search pattern and signals to be made by ships & aircraft.
 - (b) **Man-overboard procedures:** Initial actions, preparations for rescuing man, Williamson turn, picking up man and picking up boat
 - (c) **Knowledge of the contents of the IMO International Aeronautical and Maritime Search and Rescue Manual (IAMSAR)**
4. **Manoeuvre the ship**
- (a) **The effects of various deadweights, draughts, trim, speed and under-keel clearance on turning circles and stopping distances:** Advance, transfer, drift angle, tactical diameter, track reach, head reach, side reach, turning circles of a ship, directional stability.
 - (b) **Effect of wind and current on ship handling:** Effect of wind on a given ship while moving and when making large turns, effect of current on the motion of the ship, use of an anchor to dredge down with a current.
 - (c) **Manoeuvres for the rescue of a man overboard:** Immediate action, delayed action and person missing situations, single turn, Williamson turn and Scharnow turn, sequence of actions when a person is seen to fall overboard.
 - (d) **Squat and shallow-water and similar effects:** Shallow water, squat, and blockage factor.

Books recommended for reference	Author	Publisher	Year/Edn
Marine Meteorology Plus Ship's Weather Code	Capt. H. Subramaniam	Vijaya Publication	2002 / 3 rd Ed
Nautical Watchkeeping	Capt. H. Subramaniam	Vijaya Publication	2001 / 2 nd Ed
Shipborne Radar and ARPA	Capt. H. Subramaniam	Vijaya Publication	2001 / 3 rd Ed
Regs For Prevention Of Collisions At Sea (Rules Of The Road)	Bhandarkar	Bhandarkar Publications	
Nories Nautical Tables	Nories	Blance	1994
Bridge Equipment & Watchkeeping	Capt. E. Fernandes	Pro-Navigator	
ROR Set Of Cards	Bhandarkar Publications		
Bridge Team Management	Capt. A. J. Swift	Nautical Institute	2 nd Ed / 2004
Bridge Watchkeeping		Nautical Institute	4 th Ed / 1994
Watchkeeping Safety & Cargo Mgmt in Port	Capt. Peter Roberts	Nautical Institute	1 st Ed / 2005
Burton's Nautical Tables	Burton		3 rd Ed
A Guide to Collision Avoidance Rules	Cockcroft and Lameijer	Elsevier	6 th Ed / 2004
Radar & ARPA Manual	A. G. Bole and W.O. Dineley		
Radar & Electronic Navigation	G. J. Sonnen berg	Newnes- Butterworths	1963 / 3 rd Ed
GMDSS Handbook	Clifford Merchant		
Meteorology for Mariners	UK Meteorology office	Met. office	1978/3rd Ed

Pattern of Question Paper

Third Year B.Sc. Nautical Technology

Bridge Watch-Keeping Technology-Paper III

Duration: 3 Hours

Max Marks: 100

Pass Marks: 50

Note: Use of non-Programmable Scientific Calculator, Norie's/Burton's nautical tables, Ship's Weather Code is permitted. Radar Plotting Sheets will be provided.

Question No. 1 and 2 are COMPULSORY and carry 20 marks each. Attempt any SIX questions of the remaining, which carry 10 marks each. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Q.1.

Q.2.

Q.3.

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CARGO HANDLING AND STOWAGE TECHNOLOGY – PAPER III

Duration of Exam: 3 Hours

Max. Marks: 100

Pass Marks: 60

1. Dry Cargoes

- (a) Inspection and preparation of holds: General inspection of holds, items to be inspected, importance of cleaning holds, using dunnage, using spar ceiling, blanking of ballast lines to the deep tanks.
- (b) Segregation and separation of cargoes: Segregation of different cargoes with reference to dangerous goods, dry, wet & delicate cargoes, separating adjacent parcel of cargo.
- (c) Securing cargoes: Methods of blocking, lashing, shoring and tomking cargo, method of securing heavy loads and vehicles and trailers.
- (d) Ventilation and control of sweat: Control of sweat by ventilation, operation of ventilation system, cargoes requiring special ventilation.
- (e) Deck cargo: Efficient securing of deck cargoes, proper battening of cargo before loading deck cargo, safe access to essential equipment and spaces, unobstructed view from the navigating bridge, maximum permissible load, IMO code of safe practice for ships carrying timber deck cargo.
- (f) Refrigerated cargo: Preparation of hold for loading refrigerated cargo, inspections of the cargo, use of brine traps, and purpose of temperature recording.
- (g) Container cargo: Arrangement of a container ship, lashing and securing arrangement of containers, types and sizes of containers.
- (h) Bulk cargoes (other than grain): IMO code of safe practice for solid bulk cargoes, angle of repose, flow moisture point, flow state, transportable moisture limit, preparations of holds prior to loading bulk cargoes, hazards associated with coal cargoes.
- (i) Bulk grain cargoes: Bulk cargo code, preparations of holds for the carriage of grain, insect or rodent infestation, and use of shifting boards.

2. Cargo Handling

- (a) Cargo-handling equipment: Care and maintenance of standing rigging, topping lifts, cargo runners, cargo blocks and derrick heel fittings, rigging of derricks for loading and discharging of cargoes, ship rigging plan, use of slings, snotters, canvas slings, trays, pallets, nets, chain slings.
- (b) Cargo-handling safety: Safe working load of a gear, visual inspection before the start of cargo, mechanically or hydraulically operated hatches, precautions while doing cargo operations, effect of heavy lift on sea worthiness and stability of the ship, effective communication during loading and discharging. Dock Safety Regulations.
- (c) Deep tank cargoes: Cleaning and preparation of deep tanks for loading, securing of deep tank lids.
- (d) Keeping a safe deck watch in port

3. **Dangerous, Hazardous and Harmful (Marine Pollutants) Cargoes**
 - (a) Dangerous goods in packaged form: Classification of IMDG cargo, use of IMDG code, precautions to be taken while working with IMDG cargo, MFAG, EmS, Segregation tables.
 - (b) Keeping a safe deck watch in port when carrying hazardous cargo: Hazardous cargo, special requirements when carrying hazardous cargo, procedure for entry into enclosed spaces and permit to work.
4. **Tanker Piping and Pumping Arrangements:**
 - (a) Inert Gas and Venting Systems
 - (b) Oil Tanker arrangement: Cargo tanks, pump rooms, slop tanks, cofferdams, deep tanks.
 - (c) Cargo piping systems: Direct pipe line and ring-main system, piping arrangement in pump room.
 - (d) Cargo pumps: Different types of pumps for cargo operations and use of eductors.
 - (e) Gas Tankers - Tank arrangements. Piping and pumping arrangements. Tank cleaning, Safety precautions, safety check lists.
 - (f) Chemical Tankers - Tank arrangements. Piping and pumping arrangements. Tank cleaning, Safety precautions, safety check lists.
5. **Precautions before Entering Enclosed or Contaminated Spaces:** Potentially dangerous spaces like cargo, fuel and ballast tanks, pump rooms, cofferdams, duct keels, oxygen content 21% by volume, need of thorough ventilation of space, need of preparing safety check list, use of various instruments to check the gases in a compartment.
6. **Stowage Calculations**
 - (a) Cargo calculations and cargo plans: Stowage factor, broken stowage, load density, ullage, calculation of cargo to be loaded, extracts from cargo plans, making a cargo plan.
 - (b) Knowledge of the effect of the cargo including heavy lifts on the seaworthiness and the stability of the ship.

Books recommended for reference	Author	Publisher	Year/Edn
Cargo Work	Capt. E. Fernandes	Martinez Enterprises	1993/1 st Ed
Seamanship - Theory and Practice	Graham Danton	Routledge	1996/11th Ed
Watchkeeping Safety & Cargo Mgmt in Port	Capt. Peter Roberts	Nautical Institute	2005 / 1 st Ed
Tanker Operations – A Handbook for Ship's officers	G.S.Marton	Cornell Maritime Press	1992/3 rd Ed.
ISGOTT	OCIMF	Witherby	1996/4 th Ed.
Clean Seas Guide	ICS		1994/4 th Ed
MARPOL	IMO	IMO	2002
Tanker Safety Guide	ICS	Witherby	
Cargo Work	Capt. L. G. Taylor	Brown sons & Ferguson Ltd	1992/12 th Ed
Notes on Cargo Work	Kemp & Young	Standford Maritime	1980/1 st Ed
Safe Tanker Operation	Capt. K. Mistree & B. K. Sharma	Marinez Enterprises	2001 / 4 th Ed

Pattern of Question Paper

Third Year B.Sc. Nautical Technology

Cargo Handling and Stowage Technology -Paper III

Duration: 3 Hours

Max Marks: 100

Pass Marks: 60

Note: Use of non-Programmable Scientific Calculator, ASTM Tables, Norie's/Burton's nautical tables is permitted. Graph Paper will be provided.

Question No. 1 and 2 are COMPULSORY and carry 20 marks each. Attempt any SIX questions of the remaining, which carry 10 marks each. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Q.1.

Q.2.

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Q.10.

SHIP CONSTRUCTION AND STABILITY - PAPER III

Duration of Exam: 3 Hours

Max. Marks: 100

Pass Marks: 60

PART 1:- SHIP CONSTRUCTION

1. **Ship dimensions and form:** General arrangement of General cargo, tankers, bulk carriers, combination carriers, containers, Ro-Ro and passenger ships, definitions of camber, rise of floor, flare, shear, rake.
2. **Ship stresses:** Hogging, sagging, racking, panting, and pounding, slamming.
3. **Hull structure:** Proper names for the various parts, standard steel sections.
4. **Bow and stern:** Stern frame, structural arrangement forward and aft to withstand panting and pounding.
5. **Fittings:** Water tightness of the hatches, opening in oil tankers, chain lockers and attachment of cables, bilge piping system, ballast system, sounding and air pipes.
6. **Rudders and propellers:** Construction of rudders and propeller, controllable pitch propeller, stern tube arrangement.
7. **Load lines and draught marks:** Deck line, free board, Plimsoll line.
8. **Inspection of spaces** (Including corrosion and maintenance of Hull and fittings)
 - a) Knowledge and ability to explain where to look for damage and defects most commonly encountered due to:
 - Loading and unloading operations
 - Corrosion
 - Severe weather conditions
 - b) Ability to state which part of the ship shall be inspected in order to cover all parts within a given period of time
 - c) Identify those elements of the ship structure which are critical to the safety of the ship
 - d) State the causes of corrosion in cargo spaces and ballast tanks and how corrosion can be identified and prevented
 - e) Knowledge of procedures on how the inspection shall be carried out
 - f) Ability to explain how to ensure reliable detection of defects and damages
 - g) Understanding of the purpose of the enhanced survey programme

PART 2:- SHIP STABILITY

9. **Displacement:** Displacement/draft curve and table, light displacement, load displacement, dead weight, TPC, MCTC, block co-efficient, water plane co-efficient. **Buoyancy:** Meaning of buoyancy, reserve buoyancy. **Fresh water allowance:** Calculation of TPC, FWA and DWA in various densities.
10. **Statical stability:** Centre of gravity, centre of buoyancy, righting lever, righting moment. **Initial stability:** Stability upto 10° angle of heel, transverse metacentre, and hydrostatic curves. **Angle of loll:** Definition and correction of angle of loll.
11. **Curves of statical stability:** KN curves, drawing of curve of statical stability, deriving information from the curve.
12. **Movement of the centre of gravity:** Change of centre of gravity of a ship by loading, discharging, shifting of weight. List and its corrections: Calculation of list while loading, discharging or shifting weights, correction of list.
13. **Effect of slack tanks:** Free surface effect and its calculation, calculation of GM fluid.
14. **Trim:** Calculation of trim by loading, discharging or shifting weight, centre of flotation, MCTC, Trim tables.
15. **Actions to be taken in the event of partial loss of intact buoyancy:** Closing of watertight doors, cross flooding arrangement. **Stress tables and stress calculating equipment** – Indicator, Ships stability criteria, damage stability.

<u>Books recommended for reference</u>	<u>Author</u>	<u>Publisher</u>	<u>Year/Edn</u>
Ship Stability I	Capt. H. Subramaniam	Vijay Publication	1981/1st Ed
Ship Construction	Kemp & Young	Elsevier India	1 st Ed/2003
M. V. HINDSHIP	Capt. Joseph & Capt. Rewari	ARI	2002/3rd Ed
HINDSHIP Tables		Bhandarkar	
Ship Construction	E. J. Eyres	Elsevier India	1 st Ed/2003
Ship Stability for Masters and Mates	D. R. Derretts.	Butterworth Heinemann	1999/5th Ed.
Ship Stability	I.C. CLARK	Nautical Institute	2002/1 st Ed

Pattern of Question Paper

Third Year B.Sc. Nautical Technology

Ship Construction and Stability--Paper III

Duration: 3 Hours

Max Marks: 100

Pass Marks: 60

Note: Use of non-Programmable Scientific Calculator, Norie's/Burton's nautical tables and Hind-ship Tables is permitted. Graph paper will be provided.

Question No. 1, 2 and 3 are COMPULSORY and carry 20 marks each. Attempt any FOUR questions of the remaining, which carry 10 marks each. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Q.1.

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Q.3.

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Q.6.

Q.7.

Q.8.

Q.9.



SHIP OPERATION TECHNOLOGY – PAPER III

Duration of Exam: 3 Hours

Max. Marks: 100

Pass Marks: 50

PART 1: SAFETY AND MARITIME LEGISLATION

1. Prevent, Control and Fight Fires on board

- (a) Fire prevention and fire-fighting appliances
- (b) Knowledge of fire prevention
- (c) Ability to organise fire drills
- (d) Knowledge of classes and chemistry of fire
- (e) Knowledge of fire-fighting systems
- (f) Knowledge of action to be taken in the event of fire, including fires involving oil systems
- (g) Knowledge of Fire Safety Systems (FSS) Code

2. Operate Life-saving appliances

- (a) Ability to organise abandon ship drills and knowledge of the operation of survival craft and rescue boats, their launching appliances and arrangements, and their equipment, including radio life-saving appliances, satellite EPIRBs, SARTs, immersion suits and thermal protective aids.
- (b) Knowledge of survival at sea techniques
- (c) Knowledge of Life Saving Appliances (LSA) Code

3. Apply medical first aid on board the ship

Practical application of medical guides and advice by radio, including the ability to take effective action based on such knowledge in the case of accidents or illnesses that are likely to occur on board ship.

4. Monitor compliance with legislative requirements

- (a) To demonstrate basic working knowledge of the relevant IMO convention concerning SOLAS, MARPOL, Load Line, ISM and ISPS Code and STCW 95 with regards to contents, objectives, application, amendments.
- (b) Code of Safe working practices for Merchant Seamen.
- (c) Indian Merchant Shipping Act and Rules - Statutory surveys and certificates and preparations for the same. Official Log Book and the entries required therein
- (d) Classification Society surveys and certificates - Preparations for the same.

PART 2 - POLLUTION PREVENTION

Ensure compliance with pollution prevention requirements

(a) The International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) and its technical annexes: Annex - I to VI.

- Knowledge of the precaution to be taken to prevent pollution of the Marine environment while bunkering, loading/ discharging Oil, tank cleaning, pumping out bilges
- Knowledge of anti-pollution procedures & all associated equipment - Oil discharge monitoring and Control system (ODMCS).
- Oil discharge, monitoring and control system, oil and water mixture, and particularly sensitive areas.
- Control of oil from machinery spaces: Discharge provisions for oil and oily waste from machinery spaces outside special areas, within special areas, bilge water holding tank, Oil water separator.
- Oil Record Book (Part I, Machinery Space Operations) and Part II (Cargo and ballast operations): Entries to be made in oil record books.
- Precautions to be taken to prevent accidental pollution by oil: Checklist while bunkering and transferring in oil, precautions while carrying out any oil operations.
- Procedure and arrangements plan for Chemical carriers, Carriage of noxious liquids in bulk, Record Book for Chemical Cargoes.
- Carriage of dangerous goods in packaged form.
- Operating procedures of anti-pollution equipment: Sewage plant, incinerator
- Knowledge of Garbage Management System.
- Air Pollution and the control of harmful emissions such as SO_x and NO_x.

(b) Control of pollution caused due to the use of tin-based Antifouling paints

(c) Pollution caused by discharge of Ballast Water and methods of preventing this pollution.

PART 3 – SEAMANSHIP PRACTICES

1. Proper procedures for anchoring and mooring: Procedure for anchoring, use of anchor buoys, marking of the cable, sealing of spurling pipes, joining of two mooring ropes, slip wire, rigging pilot ladder, making fast tugs, Characteristics of winches and windlass
2. Types of mooring ropes and their breaking stress. Care of natural, synthetic and wire ropes.
3. Berthing and un-berthing operations, use of fenders,
4. Surface preparation and paint technology. Types of paints used for different areas of the ship. Methods of paint application. Tools and equipment used.
5. Dry-docking: Preparations for dry-docking, Operations and activities in a dry-dock
6. Tackles and purchases: Mechanical advantage gained and allowance for friction.
7. Safe Working Practices

Books recommended for reference	Author	Publisher	Year/Edn
Seamanship - Theory and Practice	Graham Danton	Routledge	1996/11th Ed
Seamanship	D. J. House		1987/1 st Ed
Manual of Seamanship	Admiralty	HMSO	1983/3 rd Ed
Seamanship Primer	Capt. J. Dinger	Bhandarkar	
Code of Safe Working Practices for Merchant Seamen		HMSO	1998
SOLAS – consolidated Edition	IMO	Bhandarkar	2004
MARPOL		IMO	2002
International Safety Management Code (ISM)	IMO	ICS	1996/3 rd Ed
International Ships and Parts Security code (ISPS)	IMO	Bhandarkar	2003
LSS Code	IMO		
FSS Code	IMO		
SOLAS Training Manual	Kelvin Hughes	I. C. Brindle & Co.	1995

Pattern of Question Paper

Third Year B.Sc. Nautical Technology

Ship Operation Technology -Paper III

Duration: 3 Hours

Max Marks: 100

Pass Marks: 50

Note: Use of non-Programmable Scientific Calculator and Norie's/Burton's nautical tables is permitted. Graph paper will be provided.

Question No. 1, 2 and 3 are **COMPULSORY** and carry 20 marks each. Attempt any **FOUR** questions of the remaining, which carry 10 marks each. If a question is sub-divided into parts, unless otherwise expressly provided against each part, all parts shall carry equal marks

Q.1.

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Q.8.

Q.9.

LIST OF EXPERTS FOR DEVELOPMENT OF COURSE MATERIAL / PAPER SETTERS / EXAMINERS / MODERATORS

Name	Qualification	Teaching Experience	Institute
Capt. K. N. Deboo	- Master Mariner of a Foreign Going Ship	10 years	Anglo Eastern Maritime Training Centre
Capt. Gulraj Chhugani	- Master Mariner of a Foreign Going Ship	3 years	Anglo Eastern Maritime Training Centre
Capt. Tescelin Almeida	- Master Mariner of a Foreign Going Ship	3 years	Anglo Eastern Maritime Training Centre
Capt. Ajit Warty	- Master Mariner of a Foreign Going Ship	5 years	Anglo Eastern Maritime Training Centre
Capt. Khushroo Mistree	- Master Mariner of a Foreign Going Ship	15 years	Anglo Eastern Maritime Training Centre
Capt. Pawan Gupta	- Master Mariner of a Foreign Going Ship & BSc Nautical Science	3 years	Anglo Eastern Maritime Training Centre
Capt. B. Puri	- Master Mariner of a Foreign Going Ship	6 years	Tolani Maritime Institute – Distance learning
Capt. G. P. Singh	- Master Mariner of a Foreign Going Ship	6 years	Tolani Maritime Institute – Distance learning
Capt. R. Sharma	- Master Mariner of a Foreign Going Ship	5 years	Tolani Maritime Institute – Distance learning
Capt. P. S. Barve	- Extra Master - Master Mariner of a Foreign Going Ship	10 years	Tolani Maritime Institute – Distance learning
Capt. V. C. D'Paiva	- M. Sc (Maritime Ed & Training) - Master Mariner	20 years	Maritime Training Institute of SCL
Capt. Keith Miranda	- Master Mariner of a Foreign Going Ship	15 years	Maritime Training Institute of SCL
Capt. K. Gupta	- M. Sc (Maritime Ed & Training) - Master Mariner of a Foreign Going Ship	10 years	Maritime Training Institute of SCL
Capt. A. Achuthan	- Extra Master - Master Mariner of a Foreign Going Ship	14 years	Massa Maritime Academy
Capt. T. K. Panda	- Extra Master - Master Mariner of a Foreign Going Ship	5 years	Massa Maritime Academy
Capt. A. P. Singh	- Extra Master - Master Mariner of a Foreign Going Ship	8 years	Massa Maritime Academy
Capt. A. Parackal	- Master Mariner of a Foreign Going Ship	8 years	Massa Maritime Academy
Capt. S. R. Sahoo	- Master Mariner of a Foreign Going Ship	3 years	Massa Maritime Academy
Capt. S. Nivas	- Master Mariner of a Foreign Going Ship	3 years	Massa Maritime Academy

Sr. No.	Name	Qualification	Teaching Experience	Institute
10.	Capt. A. K. J. Pandey	- Master Mariner of a Foreign Going Ship	10 years	Massa Maritime Academy
11.	Capt. Y. Sharma	- Master Mariner of a Foreign Going Ship	7 years	International Maritime Training Centre
12.	Capt. V. Shedde	- Master Mariner of a Foreign Going Ship	7 years	International Maritime Training Centre
13.	Capt. R. Prakash	- Master Mariner of a Foreign Going Ship	5 years	International Maritime Training Centre
14.	Capt. V. K. Barve	- Master Mariner of a Foreign Going Ship	5 years	International Maritime Training Centre
15.	Capt. H. Subramaniam	- Extra Master - Master Mariner of a Foreign Going Ship	38 years	Eurasia Centre for Advanced Learning
16.	Capt. A. P. Sethi	- Extra Master - Master Mariner of a Foreign Going Ship	14 years	Eurasia Centre for Advanced Learning
17.	Capt. S. Y. Limaye	- Master Mariner of a Foreign Going Ship	12 years	Lal Bahadur Shastri College of Advanced Maritime Studies & Research
18.	Capt. A. G. Bhatia	- Extra Master - Master Mariner of a Foreign Going Ship	11 years	Lal Bahadur Shastri College of Advanced Maritime Studies & Research
19.	Capt. R. Sagar	- Extra Master - Master Mariner of a Foreign Going Ship	5 years	Lal Bahadur Shastri College of Advanced Maritime Studies & Research
20.	Capt. R. Panigrahy	- Extra Master - Master Mariner of a Foreign Going Ship	4 years	Lal Bahadur Shastri College of Advanced Maritime Studies & Research
21.	Capt. Errol Fernandes	- Extra Master - Master Mariner of a Foreign Going Ship	12 years	Lal Bahadur Shastri College of Advanced Maritime Studies & Research
22.	Capt. S. S. Chaudhary	- Extra Master - Master Mariner of a Foreign Going Ship	11 years	Lal Bahadur Shastri College of Advanced Maritime Studies & Research
23.	Capt. P. Kumar	- Extra Master - Master Mariner of a Foreign Going Ship	30 years	Lal Bahadur Shastri College of Advanced Maritime Studies & Research
24.	Capt. Sundaram	- Extra Master - Master Mariner of a Foreign Going Ship	8 years	Training Ship Chanakya
25.	Capt. S. Sinha	- Master Mariner of a Foreign Going Ship	5 years	Training Ship Chanakya
26.	Capt. Mishra	- Master Mariner of a Foreign Going Ship	3 years	Training Ship Chanakya
27.	Capt. Paes	- Master Mariner of a Foreign Going Ship	10 years	Training Ship Chanakya
28.	Capt. J. B. Singh	- Master Mariner of a Foreign Going Ship	5 years	Training Ship Chanakya
29.	Capt. Himmat Singhani	- Master Mariner of a Foreign Going Ship	20 years	Maritime Engineering and Research Institute.

Sr. No.	Name	Qualification	Teaching Experience	Institute
40.	Capt. Warty	- Master Mariner of a Foreign Going Ship	2 years	Maritime Engineering and Research Institute.
41.	Capt. Idnani	- Master Mariner of a Foreign Going Ship	10 years	Maritime Engineering and Research Institute.
42.	Capt. S. S. Manjeshwar	- Master Mariner of a Foreign Going Ship	10 years	Wallem Maritime Training Centre
43.	Capt. Shingatgiri	- Extra Master - Master Mariner of a Foreign Going Ship	8 years	Wallem Maritime Training Centre
44.	Capt. A. Raghavan	- Extra Master - Master Mariner of a Foreign Going Ship	6 years	Chellaram Shipping (CTO) Ex LBS College of Advanced Maritime Studies & Research
45.	Capt. K. D. Writer	- Master Mariner of a Foreign Going Ship	10 years	V-Ships Training Centre
46.	Capt. K. Khambatta	- Extra Master - Master Mariner of a Foreign Going Ship	4 years	OMCI Company Training Officer
47.	Capt. K. V. Pradhan	- Master Mariner of a Foreign Going Ship	7 years	Elite Mariners Ltd. Company Training Officer
48.	Capt. P. K. Deshpande	- Master Mariner of a Foreign Going Ship	6 years	Great Eastern Training Institute
49.	Capt. Y. Mishra	- Master Mariner of a Foreign Going Ship	7 years	Great Eastern Training Institute
50.	Capt. T. K. Joseph	- Extra Master - Master Mariner of a Foreign Going Ship	40 years	Ex-Principal, LBS College of Advanced Maritime Studies and Research
51.	Capt. J. K. Mathur	- Master Mariner of a Foreign Going Ship	10 years	Vasant Dada Patil College of Engineering (OERC)
52.	Capt. T. D. Hazari	- M.Sc (Maritime Edu + Training) - Extra Master	20 years	Shipping Corporation of India
53.	Capt. H. Swaminathan	- B.Sc Nautical Science - Extra Master	5 years	Fleet Management Training Centre
54.	Capt. Shingare	- Master Mariner of a Foreign Going Ship	7 years	Fleet Management Training Centre
55.	Capt. M. Patankar	- Extra Master - Master Mariner of a Foreign Going Ship	3 years	K. C. Maritime Ltd.
56.	Capt. M. Naik	- Extra Master - Master Mariner of a Foreign Going Ship	7 years	Dynacom Tankers Ltd.
57.	Capt. R. S. Singh	- Master Mariner of a Foreign Going Ship	6 years	B. P. Marine Academy
58.	Capt. A. K. Singh	- B. Sc Nautical Science - Master Mariner of a Foreign Going Ship	3 years	B. P. Marine Academy
59.	Capt. M.C.Yadav	- B.Sc. - Extra Master	16 years	FOSMA Maritime Institute and Research Organisation

INDIAN NATIONAL SHIPOWNERS' ASSOCIATION

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List of Members**MUMBAI****Arcadia Shipping Limited**

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 Mr. H. N. Shah – Director
 Mr. V. N. Shah – Director
 Mr. D. J. Malvankar – General Manager -Shipping

Century Shipping

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Mr. S.K.Sood – Executive President

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 Mr. M.P.Patwardhan – Executive Director
 Mr. V.S. Murthy – Company Secretary & GM

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 Mr. A.R.Ramakrishnan

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 Mr. Sudhir J. Mulji – Executive Deputy Chairman

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Fax : 26521414/1515

Email : skgupta@ambujamail.com

Representatives:

Capt. S. K. Gupta – Asst. Vice President (Shipping)
 Mr. V.S. Iyengar – Sr. Manager (Shipping)

Mercator Lines Ltd.

Mittal Tower, B Wing, 8th floor
 Nariman Point
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Tlx : 83846 MLL IN

Fax : 56373344/22811029

Email: mll@vsnl.com

Representatives:

Mr. Atul J Agarwal – Director

Pratibha Shipping Company Ltd.

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 Fax : 22828428

Email : pscl@vsnl.com/pscl@hathway.com

Representatives:

Mr. Sunil Pawar – Managing Director

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 Fax : 22873986
 E-mail : rajship@vsnl.com
 Representatives:
 Mr. Adi Mehta - Managing Director
 Mr. Noshir A. Mehta - Director
 Mr. Pervez A. Mehta - Director

Reliance Industries Ltd.
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 Off. Reay Road Station (E)
 Mumbai - 400 033
 Tel : 304121181/1199(D)
 Tel : 30411000/1000 (Board)
 Fax : 30411089
 Email : mv_ramamurthy@ril.com
 Representatives:
 Mr. R. L. Pai - Group Sr. Vice President
 Mr. M. V. Ramamurthy, Sr. Vice President
 (Shipping)

SKS (Ship) Ltd.
 404 Abhay Steel House,
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 Tel : 23730713/4/5/6
 Fax : 23710362/3740219
 Email : shah1@bom3.vsnl.net.in
 Representative:
 Mr. S. K. Shahi - Chairman & Managing Director
 Dr. M.K. Sinha - Vice Chairman & Director

Shipping Corporation of India Ltd.
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 Nariman Point, Mumbai - 400 021
 Tel : 22026666
 Tlx : 011-82314/82371/82766/84548/86594
 Fax : 22022949/22026905
 Email : cmd@sci.co.in
 Representative:
 Mr. P. K. Srivastava - Chairman & MD

Shreyas Shipping Ltd.
 912 Embassy Centre, 9th floor
 Nariman Point, Mumbai - 400 021
 Tel : 22842324/25/28, Fax : 22886665
 Email : devli@shreyas.co.in/captsingh@shreyas.co.in
 Representatives:
 Mr. Anil Devli - Executive Director
 Capt. V. K. Sing O (GM - Commercial & Operations)

South East Asia Marine Engineering & Construction Ltd.
 The Eagle's Flight, 401-404, 4th floor
 Suren Road, Off. Andheri Kurla Road
 Andheri (East), Mumbai - 400 093
 Tel : 56941800
 Fax : 56941818
 Email : crodricks@technip.com
 Representative :
 Capt. Chris J Rodricks, MD

TAG Sealogistics Limited
 Essar House, P.O.Box. 7945
 Mahalaxmi, Mumbai - 400 034
 Tel : 24950606/56601100
 Fax : 56601144/24954312
 Email : tsl@tagsea.net
 Representatives:
 Mr. Nandan Kilpady

Tidewater (India) Pvt. Ltd.
 203, Sentinel Building
 Hiranandani Business Park
 Powai, Mumbai - 400 076
 Tel : 5502 0925
 Fax : 55020929
 Email : cmckenny@tdw.com
 Representatives:
 Mr. Chris Mckenny - Area Manager

Tolani Shipping Co. Ltd.
 10-A, Bakhtawar
 Nariman Point, Mumbai - 400 021
 Tel : 56568989
 Tlx : 011-82751/84861, Fax : 22870697
 Email : ops@tolanigroup.com
 Representatives:
 Dr. N. P. Tolani - Managing Director
 Mr. Rohet N. Tolani - Director
 Mr. A. K. Srivastava - Exe. Director

United Shippers Limited
 United India Building, 2nd floor
 Sir. P.M. Road, Fort, Mumbai - 400 001
 Tel : 22662232/56658300/56658301
 Fax : 56658392
 Email : operations@unitedshippers.com
 Representatives:
 Mr. Sunil Parekh - Managing Director
 Capt. Sanjay Goel - General Manager

Representative:
Mr.P. Viswanathan - Executive Director

Varun Shipping Co. Ltd.

Laxmi Building, 6, shoorji Vallabhdas Marg,
Ballard Estate, Mumbai - 400 001

Tel : 56350100

Tlx : 011-81010 VSC IN

Fax : 56350200/300

Email : commercial@varunship.com

Representatives:

Mr. Yudishthir D. Khatau - Managing Director

Mr. Arun Mehta - Vice Chairman & Managing
Director

Mr. Avtar S. Wadhwan - Vice President
(Technical Operations & New Projects)

CHENNAI

Gati Coast to Coast

Laxmi Towers, (2nd floor)

27/5 Dr. Radhakrishnan Salai

Mylapore, Chennai - 600 004

Tel : 28110235/28112734/28111362

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Email : gatiship@vsnl.com

Representative:

Mr. T. Kumaran - Vice Preside

Good Earth Maritime Ltd.

"Haveli" No.2 (Old 32-D)

North Crescent Road

T.Nagar, Chennai - 600 017

Tel : 28153479/80/81

Fax : 28156797

Email : info@archeangroup.com

Representative:

Mr.S. Madhan - Managing Director

Poompuhar Shipping Corpn. Ltd.

692 (Old 473) Anna Salai, 4th floor

Nandanam, Chennai - 600 035

Tel : 24330058/24330505/24330807

Tlx : 4123230/23264 PSC IN

Fax : 24344593/24335706

Email : pscit@viasmd01.vsnl.net.in

Representative:

Capt. K. C. Thomas - GM (Operations)

Sanmar Shipping Ltd.

9 Cathedral Road, Chennai - 600 086

Tel : 28118200

Tlx : 041-7305 CHEM IN/8479 GEON IN

Fax : 28112453/28112627

Email : ship@sanmargroup.com

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Sanmar Shipping Ltd.

407/412 Sawstik Chambers

Sion Trombay Road

Chembur, Mumbai - 400 071

Tel : 25973390 Fax : 25973395

South India Corpn. Ltd.

Rani Seethai Hall Building

6th floor (Right Wing)

603 Anna Salai, Chennai - 600 006

Tel : 28295001/52089911/9922/9933

Tlx : 041-6750 SISCO IN

Fax : 28295121

Email : chettinadshipping@vsnl.net

Representatives:

Mr. S.P. Palaniappan - Director

Mr. V.R. Arunachalam - Chief Executive

TCI Seaways Ltd.

No.92, IV Floor, Gee Gee Crystal.

Dr. Radhakrishnan Salai, Mylapore

Chennai - 600 004

Tel : 28117581/82/83/28117572/78/79

Fax : 28117573

Email : seamds@tcil.com

Representatives:

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Capt. R. Burman - GM Operations

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Transport Corporation of India Ltd.

Transport House

5th floor,

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Mumbai - 400 009

Representatives:

Mr. M. L. Agarwal - Sr. Vice President

West Asia Maritime Ltd.

Buharia Towers - Ground Floor

No.4, Moores Road, Chennai - 600 006

Tel : 28241431/41/51/61/71

Tlx : 7928 WAML IN / 7982 WAML IN

Fax : 28266976

Email : wamship@vsnl.com

Representatives:

Mr. R. Srinivasan - Executive Director

Mr. Abdul Qadir - Managing Director
Mr. S.A. Joshi - Vice President (Commercial)

KERALA

Trans Asian Shipping Services (P) Ltd.

39/214, ABC Suryodaya Building

Mullassery Canal Road

Cochin - 682 011

Tel : 0484 2353083, 2350965

Fax : 0484 2380040

Email: jmkts@vsnl.net

Representatives:

Mr. Jhonson Mathew - Managing Director

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608 Dalamal Towers, 6th floor

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Representatives:

Mr. P.A. Mathew - Branch Manager

GUJARAT

Jaisu Shipping Company Pvt. Ltd.

Kewalramani House

Dinshaw Bldg Rd., Nr. Custom House

Kandla Port (Gujarat) - 370 220

Tel : (02836) 270538/270428/270128

Fax : (02836) 270556/270650/260389

Representatives:

Mr. Suresh G. Kewalramani - C & MD

Mr. Pitam G. Kewalramani - Director

Mumbai Office

Jaisu Shipping Co. Pvt. Ltd

B/1, Common Wealth,

181, Madame Cama Road

Opp. Air India Bldg, Mumbai - 400 020

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Fax : 22021259/22021805

HYDRABAD

Ocean Sparkle Limited

1st floor, 128, Srinagar Colony

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Tel : (040) 3743507/3741138

Fax : (040) 3748752

Email : oslhyd@oceansparkle.com

Representative:

Mr. P. Jairaj Kumar - Managing Director

Mumbai Office

Ocean Sparkle Limited

136, Mahendra Chambers

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Tel : 56364822, Fax : 56364823

Email : oslmum@oceansparkle.com

Representative:

Mr.S.B.Singh, Manager P & A

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India Steamship Company Ltd.

44, Park Street,

Kolkata - 700 016

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Tlx : 21-2549 ISS IN

Fax : 22831805/22813792

Email : md@indiasteamship.org

ed@indiasteamship.org

Representative:

Mr. Ashok Kak - Managing Director

Mr. K. K. Palit - Executive Director

Surrendra Overseas Limited

Apeejay House, 15, Park Street,

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Tel : 22295455/6/7/8

Tlx: 021 5627, Fax: 22179596

Email : solcal@apeejaygroup.com

Representatives:

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Capt. A. K. Rathee

Mumbai Office

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Representative:

Mr.A.P. Soans

VISAKHAPATNAM

Dredging Corporation of India

Dredge House, Port Area

Visakhapatnam – 530 035

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Fax : 0891-2560681/2565920

Email : info@dcj.co.in

nkgupta@dcj.co.in

Representatives:

Mr. N. K. Gupta – Managing Director

Mr. M.N.K.S. Varma – Jt GM (P&A)

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Dredging Corporation of India

101-A, Mittal Chambers

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FOREIGN OWNERS REPRESENTATIVES & SHIPMANAGERS ASSOCIATION

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E-mail : fosma@vsnl.com; Website: www.fosma.com

Capt. M. C. Yadav - Director (Maritime Education & Training)

Mr. O. P. Kapur - Secretary

LIST OF MEMBER COMPANIES

Name of the Company	E-mail	Telephone	Fax No.	Address
1. Accord Manning Services Pvt. Ltd.	manning@accordship.com	5693 0701 5693 0708	5693 0700 5693 0725	301/A, Shreya House, Parera Hill Road, Off Andheri-Kurla Road, Andheri (E), MUMBAI - 400 099. <i>Name of Representative : Capt. D. N. Bal</i>
2. Andromeda Shipping (India) Pvt. Ltd.	starship@andromeda-india.com	2684 5850/80/48/68	2684 5299	302, Trade Avenue, 3rd Floor, 260 Suren Road, Andheri (E), Mumbai- 400 093 <i>Name of Representative : Mr. Noel Alphonso</i>
3. Asia Maritime Services Pvt. Ltd.	asiamar@bom3.vsnl.net.in	2285 3881 2285 5705	2285 1553 2288 1800	No.2, Rehem Mansion, 44, S.B. Road, Colaba Causeway, MUMBAI - 400 039. <i>Name of Representative : Capt. S. Lambay</i>
4. Barber Ship Management (India) PVT. Ltd.	deepak.laud@barbership.com	2687 3210	2687 0977	31/32, Apple Heritage, Plot No.54-C, Sir Mathuradas Vasanji Road, Andheri (E), MUMBAI - 400 093. <i>Name of Representative : Capt. Yashoverman Sharma</i>
5. Bergesen DY India Pvt. Ltd.	easow.thomas@bergesen.no india@bergesen.no	5675 1011	5695 9564	Worldwide Shipping Agency (s) Pte. Ltd., 841, Solitaire Corporate Park, 167, Guru Hargovindji Marg, Andheri- Ghatkopar Link Road, Chakala, Andheri (E), Mumbai 400 093 <i>Name of Representative : Capt. E. Thomas</i>

Name of the Company	E-mail	Telephone	Fax No.	Address
6. Bibby International Services (India) P.Ltd.	enquiries@bis-india.com	2673 2651 2673 2652 2673 2628	2673 2629	101/103, Midas Chambers, Off Link Road, Andheri (W), MUMBAI - 400 053. <i>Name of Representative : Mr. OM Prakash M Agarwal</i>
7. Chellaram Shipping Pvt. Ltd.	sm @chellship.co.in	2207 0035 2207 0045 5635 7345	2207 8984	3rd Floor, Gazdar House, 629-A, J. Shankar Sheth Road, MUMBAI - 400 002. <i>Name of Representative : Mr. Sandeep Malankar</i>
8. Confidence Shipping Co. Pvt. Ltd.	confiden@bom2.vsnl.net.in	2673 2052 (8 lines)	2673 2061 2673 2062	A-401, Remi Biz Court, Shah Ind. Estate, Veera Desai Road, Andheri (W), MUMBAI - 400 058. <i>Name of Representative : Mr. Asok Chattopadhyay</i>
9. Dhruvtara Shipping & Placement Services Pvt Ltd.	dhruvtara@dhruvtarashipping.com	2757 2430	2757 2430	204, Sai Chambers, Sector 11, CBD Belapur, Navi Mumbai-400 614 <i>Name of Representative : Mr. Shyam Lal Yadav</i>
10. Dockendale Shipping Company Ltd.	dockship@vsnl.com	5694 2191	5694 2190	103, Technopolis Knowledge Park, Mahakali Caves Road, Chakala, Andheri (E), MUMBAI - 400 093. <i>Name of Representative : Capt. J. R. Vaz</i>
11. Dynacom Tankers Management Ltd.	capmnaik@vsnl.com	2834 7349 2834 7380	2834 7294	301/3RD Floor, Crystal Plaza, New Link Road, Chakala, Andheri (E), MUMBAI - 400 099. <i>Name of Representative : Capt. M.V. Naik</i>

Name of the Company	E-mail	Telephone	Fax No.	Address
12. ELITE Mariners Pvt. Ltd.	elitemariners@vsnl.com	5698 7667	5698 7668	D - 404, Remi Biz Court, Shah Industrial Estate, Veera Desai Road, Andheri (W), MUMBAI - 400 053. <i>Name of Representative : Capt. K.S. Paintal</i>
13. Eurasia Maritime Management (India) Pvt.Ltd	eurasia.mumbai@eurasiagroup.com sub.h@eurasiagroup.com	5697 1588	5697 1558	401, Olympia, Hiranandani Gardens, Powai, MUMBAI - 400 076 <i>Name of Representative : Capt. H. Subramaniam</i>
14. Fleet Personnel Pvt. Ltd.	fppl@fleetpersonnel.com	5632 5058 5632 5059	5632 5057	322, Tulsiani Chambers, Nariman Point, MUMBAI - 400 021. <i>Name of Representative : Mrs. Anjali Bhide</i>
15. Genoa Maritime(Cyprus) Ltd.	genoa.mumbai@vsnl.net	5679 7460	5679 7462	338, Laxmi Plaza, Laxmi Ind Estate, Link Road, Andheri (W) . MUMBAI-400 053. <i>Name of Representative : Capt. Sanjeev. M. Vadhavkar</i>
16. Herald Maritime Services Pvt. Ltd.	hmsnet@herald-maritime.com	2281 0730	2202 5998	317-318, Dalamal Tower, 'A' wing, Nariman Point, MUMBAI - 400 021. <i>Name of Representative : Capt. R.Y. Barve</i>
17. IMS Ship Management Pvt Ltd.	info@imsship.com	2283 0823 2283 0395	2287 5608	12-A Earnest House, 194, NCPA Marg, Nariman Point, Mumbai-400 021 <i>Name of Representative : Capt. S.C. Sood</i>
18. KC Maritime (India) Ltd.	mail@kcmaritime.co.in	2288 3309 2288 3395 2284 5927	2288 3228	35, Maker Chambers - III, 3rd Floor, Nariman Point MUMBAI - 400 021. <i>Name of Representative : Capt. M.K. Patankar</i>

Name of the Company	E-mail	Telephone	Fax No.	Address
19. "K" Line Ship Management Co. Ltd. (KLSM)	k-line@vsnl.net	5668 0815	5668 0814	F-603/604, Remi Biz Court, Veera Desai Road, Shah Industrial Estate, Andheri 'W', Mumbai-400 053 <i>Name of Representative : Capt. S. K. Goyal</i>
20. Lalkar Marine Pvt. Ltd.	lalkar@bom3.vsnl.net.in	2283 3064 2204 4961	2202 4373	137, Arcadia, NCPA Marg, Nariman Point, MUMBAI - 400 021. <i>Name of Representative : Mr. A.K. Karmakar</i>
21. Lizlyn Ship Management Pvt Ltd	lizlynshipindia@hotmail.com	2640 9913 2640 9918	2640 9976	98-A, 411/412, 4th Floor, (Merchant Chamber), Guruvudya Co-op.Hsg.Soc.Ltd, Ramdas Nayak Marg, Hill Road, Bandra (W), Mumbai-400 050 <i>Name of Representative : Capt. Gino A. de Sousa</i>
22. Marine Management Services Pvt. Ltd.	mms1@vsnl.com	2284 1534 2284 4286 2287 2252	5630 6841	817, Raheja Chambers, 213, Nariman Point, MUMBAI - 400 021. <i>Name of Representative : Mr. S.V. Godbole</i>
23. Mitsui O.S.K. Lines Maritime (India) Pvt. Ltd.	molmi@molmi.com	5696 0999	5696 0888	241-242, Solitaire Corporate Park, 4th Floor, Bldg.No.2, Sir Mathuradas VasANJI Road, Chakala, Andheri (E), MUMBAI - 400 093. <i>Name of Representative : Capt. Abhijit Chattopadhyay</i>
24. MMS Maritime Agency (India) Pvt. Ltd.	mmsi@mms-india.com	5696 0181 5696 0182 5693 9920	5696 0183	171, Solitaire Corporate Park, 151, Sir Mathuradas VasANJI Road, Chakala, Andheri (E), MUMBAI - 400 093. <i>Name of Representative : Mr. Sanjay Kumar Bhavnani</i>

Name of the Company	E-mail	Telephone	Fax No.	Address
25. Nortrans Maritime Services	nsmbombay@nortrans.co.in	2288 2723 2288 2724 2288 2725	2285 4335	803, Embassy Centre, Nariman Point, MUMBAI - 400 021. <i>Name of Representative : Capt. Gordon Reilly</i>
26. NYK Shipmanagement PTE Ltd.	rk.mehrotra@nyksm.com	2839 2760	2839 2761	303, Ascot Center, Sahar Road, Near Le Meridian Hotel, Andheri E, Mumbai-400 099 <i>Name of Representative : Capt. R. K. Mehrotra</i>
27. Ocean Blue Management Pvt. Ltd.	obm@obmindia.com	2824 4696 2824 4575 2824 4881	2822 2388	601, Acme Plaza, Opp. Sangam Theatre, Andheri – Kurla Road, Andheri (East) , MUMBAI - 400 059 <i>Name of Representative : Mr. Clement F. Rebello</i>
28. Orient Ship Management & Manning Pvt. Ltd.	orient@bom4.vsnl.net.in	2673 6461 2673 6459 2673 6460	5692 1626 5692 1628	6th Floor, Global Chambers, Next to Dheeraj Gaurav Heights, Adarsh Nagar, New Link Road, Andheri (W), Mumbai 400 053 <i>Name of Representative : Mr. A.M. Mathur</i>
29. Orinoco Marine Consultancy (India) Pvt. Ltd.	omci@bom4.vsnl.net.in	5640 7200	5640 7350	1 st Floor, Leela Business Park, Andheri-Kurla Road, Andheri(E) MUMBAI – 400059 <i>Name of Representative : Capt. S. Bharatan</i>
30. Pacific Shipping Pvt. Ltd.	khurana@bom3.vsnl.net.in	2287 3064 2283 5034	2285 3379	132-C, Mittal Court, Nariman Point, MUMBAI - 400 021. <i>Name of Representative : Capt. Suresh Khurana</i>
31. Pelican Marine Pvt. Ltd.	pelican_marine@vsnl.com	5637 4581 2267 2597 2269 6676	5637 4584 2267 2508	407, Jolly Bhavan No.2, 7, New Marine Lines, MUMBAI - 400 020. <i>Name of Representative : Mr. Santosh C. Biswas</i>

Name of the Company	E-mail	Telephone	Fax No.	Address
32. Race Shipping & Transport Co. P.Ltd.	confiden@bom2.vsnl.net.in	2673 2095 2673 2052 (8 lines)	2673 2061 2673 2062	401 to 404/A, Remi Biz Court, Shah Ind. Estate, Veera Desai Road, Andheri (W), MUMBAI - 400 058 <i>Name of Representative : Mr. S. Banerjee</i>
33. Seaspan Crew Management Ltd	scml@seaspanindia.com	28374961/62	28374964	502 Centre Point, J. B. Nagar, Andheri Kurla Road, Andheri (E), Mumbai-400 059 <i>Name of Representative : Mr. Ashok Advani</i>
34. Selandia Marine Services Pvt. Ltd.	mail@selandia.net	2628 0807 2628 8156 2670 7810	2671 2065	5th Floor, Soni House, Gulmohar Park, 34, Gulmohar Road, JVPD Scheme, Vile Parle (W), MUMBAI - 400 049 <i>Name of Representative : Capt. U.R. Thakore</i>
35. United Ocean Ship Management Pte. Ltd.	mumbai@unitedocean.com.sg	2287 2400 2285 2801	2282 9921	505, Raheja Chambers, 213, Nariman Point, MUMBAI - 400 021. <i>Name of Representative : Capt. D.J. Masurekar</i>
36. V. Ships Inc.	rajesh.tandon@vships.com	2284 3393	2284 3310	407-408, Maker Chambers V, Nariman Point, MUMBAI - 400 021 <i>Name of Representative : Capt. Rajesh Tandon</i>
37. Wilco Shipmanagement & Travels Pvt. Ltd	KG@wallem.com	2673 3522 2673 3461	2673 3634	1st Floor, Valecha Chambers, Plot B-6, Andheri New Link Road, Andheri (W), MUMBAI - 400 053 <i>Name of Representative : Capt. K. Guha</i>
38. World Tankers Management Pte. Ltd.	wdtank@vsnl.com	2284 2860 2283 6229	2283 6230	504, Embassy Centre, Nariman Point, MUMBAI - 400 021 <i>Name of Representative : Capt. Manoj Kumar Chaudhary</i>

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Capt. S. S. Jairam
Chairman

Capt. A. P. Kothurkar
Secretary

Mr. A. D'sa
Administrator

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Name and Address of Agents	Name and Address of Principals
Adsteam Agency (India) Ltd 10th Floor, 102, Sakhar Bhavan Nariman Point Mumbai 400 021 Tel. : 56301820 (5 lines) Fax : 56301838 / 2281 2408 E-mail : manning.bom@adsteam.co.in <u>Representatives</u> Mr. S.Kejriwal – Financial Controller/Admn Mgr – India Mr. N.G. Poojari – Bulk & Tramp Mgr - India Mr. Shailendra Padmanabhan – Asst Mgr Manning	...
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- do -	Anglo Eastern Group, Hong Kong 23/f, 248 Queen's Road (E) Wanchai, Hong Kong
- do -	Anglo Eastern Crew Management 23/f, 248 Queen's Road (E) Wanchai, Hong Kong

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ASP Ship Management (India) Pvt. Ltd 58, Nariman Bhavan, Nariman Point Mumbai 400 021 Tel. : 56322515 Fax : 56322509 E-mail: aspships@vsnl.net <u>Representatives</u> Mr. David Borcoski, Director Mr. A. Kesargodi, General Manager	Chowgule Steam Ships Ltd Bakhtawar, 3rd Floor Nariman Point Mumbai 400 021
Crew Management Services (India) Pvt. Ltd. 58, Nariman Bhavan, Nariman Point Mumbai 400 021 Tel. : 5632 2510 / 5632 2515 Fax : 5632 2509 E-mail : cms-mumbai@mumbai.aspships.com mumbai@crewships.com vpereira@crewships.com <u>Representatives</u> Capt. Vincent F. J. Pereira, Director Mr. Jean Keraudren, Director Mr. David Borcoski, Director	Crew Management Services Ltd. (Singapore Branch) 10, Hoe Chiang Road, # 21-03, Keppel Towers, Singapore 089315
...	Expedo Shipmanagement (Canada) Ltd. One, City Centre Drive, Suite 1510 Mississauga Ontario L5B IM2 Canada <u>Indian Liaison Office</u> Expedo Marine Services India 34/698, Palarivattom, Cochin 682 025 Kerala

Name and Address of Agents	Name and Address of Principals
	Tel. : 0484 2339584 Fax : 0484 2341093 E-mail : capt.j.k.thomas@vsnl.com <u>Resident Representatives</u> Capt. Jose K. Thomas, MNI
Cenmar Maritime Agencies (India) Pvt. Ltd. 64/A, Mittal Court, Nariman Point, Mumbai 400 021 Tel. : 2202 2278 / 79 Fax : 2202 2250 E-mail : cenmar.india@hathway.com <u>Representatives</u> Cmdr. Nicholas A. Ilopoulos, Director Capt. Y.P.S. Parmar, General Manager Mr. Y. Mulgaonkar, Dy. Gen. Manager	Quality Management Co. C/o. 10, Diadochou Pavlou 166 75 Glyfada, Athens, Greece. Roseland Management Co. C/o. 10, Diadochou Pavlou 166 75 Glyfada, Athens, Greece. Tel. : +30 210 8983305 Fax : +30 210 8983231 E-mail : contact@marinetrust.gr
Ebony Ship Management Pvt. Ltd. 101, The Great Eastern Galleria, 1st Floor, Sector 4, Nerul New Mumbai 400 706 Tel. : 5592 6100 Fax : 5592 6200 E-mail : FLEET-IN.BOM-MANNING@fleetship.com <u>Representatives</u> Capt. P.S. Rangnekar, General Manager- India Operations Mr. Dilip Misra, Superintendent Capt. Anshul Rajvanshy, Marine Superintendent	Fleet Management Ltd., Room 1703, 17th Floor Mass Mutual Tower, 38, Gloucester Road, Hong Kong
Forbes Gokak Ltd. Forbes Building, 3rd Floor Charanjit Rai Marg Fort Mumbai 400 001 Tel. : 22005282 / 22008081 / 22094961 Fax : 22004954 E-mail : zenobia.kaikobad@mumbai.imtship.com forbes@mumbai.imtship.com <u>Representatives</u> Mrs. Z. P. Kaikobad, Gen. Mgr. (Admn. & Finance) Mr. K. M. Dubash, Manager, Fleet Personnel	International Marine Transportation Ltd. Forbes Building, 3rd Floor, Charanjit Rai Marg Fort Mumbai 400 001

Name and Address of Agents	Name and Address of Principals
Geepee Shipping Agencies Pvt. Ltd. 1003, Dalamal House 206, Nariman Point Mumbai 400 021 Tel. : 22873574 / 22873577 / 22873587 Fax : 22045177 E-mail : gpship@bom2.vsnl.net.in gpship@vsnl.com <u>Representatives</u> Capt. Charles Carvalho Capt. Kenneth D'Souza Mr. Sham Gothivrekar	Great Circle Shipping Agencies Ltd. 8/35, North Sathorn Road, Bangkok 105 00 Thailand
IMC Shipping Co. Pte. Ltd. (India Liaison Office) Remi Bizcourt, "A" Wing, A-301 & A-302, 3rd Floor, Plot No. 9 Shah Industrial Estate, Off Veera Desai Road, Andheri (West) Mumbai 400 053. Tel. : 5691 0645 & 5691 0646 Fax : 5691 0647 E-mail : imcscind@vsnl.com <u>Representatives</u> Capt. E. Lobo, Country Representative Capt. N. K. Bhatia, Port Captain	...
J. M. Baxi & Co. Fleet Personnel Department Sarvodaya Building, 2nd Floor 70-A, Nehru Road, Vile Parle (East) Mumbai 400 099 Tel. : 26113710 (D) / 22654630 / 26115516 Fax : 26105924 / 22613568 E-mail : ebp@aryaoffshore.com fleet@jmbaxi.com <u>Representatives</u> Capt. E. B. Pereira, Vice President - Fleet Personnel	Livestock Transport & Trading Co. KSE Entrance No. 3, 4th Floor Salhiya Commercial Complex P. O. Box 23727, 13098, Safat Kuwait
- do -	Almawashi Almukairish United Co. P.O. Box 6352 Jeddah 21442 Saudi Arabia
Killick Marine Services Ltd. Commercial Union House, 2nd Floor 9, Wallace Street Fort, Mumbai 400 001	United Arab Shipping Co. (SAG) Jamal Abdul Nasar Street P. O. Box 3636, Safat Kuwait

Name and Address of Agents	Name and Address of Principals
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Killick Nixon Ltd. Commercial Union House, 9, Wallace Street Fort, Mumbai 400 001 Tel. : 22072311 to 13 and 22071493 Fax : 22075204 E-mail : knlship@bom8.vsnl.net.in <u>Representatives</u> Mr. T. B. Patel	
KNK Ship Management 72/73, Mahendra Chambers, 2nd Floor, Dr. D. N. Road, Fort Mumbai 400 001 Tel. : 22071576 / 22071567 / 22076222 / 26370592 Fax : 22077068 E-mail : Pluto@vsnl.com knkship@vsnl.net <u>Representatives</u> Capt. Naresh Kalra, President Mr. Dhaniram Sharma, Gen.Mgr. (Marine Engineer) Mr. Ignatius Anthony, Manager (Fleet Personnel) Mr. Satish Shanbhaug, Electric Engineer (Supervisor)	Tradeco Enterprises 191 B, Thomson Road, Goldhill Centre Singapore 1130
Lal Ship Management Pvt. Ltd. Vijay Villa, G-2, Ground Floor, Vidhya Villa Compound, Old Nagardas Road, Andheri (East), Mumbai 400 069 Tel. : 28314308 / 28314309 / 28314310 Fax : 28314316 E-mail : lalmaritime@vsnl.net lalship@vsnl.net	Lal Ship Management (M) SDN BHD Suite 1903, 19th Floor, Plaza Permata, No. 6, Jalan Kampar 50400 Kuala Lumpur Malaysia

Name and Address of Agents	Name and Address of Principals
<u>Representatives</u> Mr. Lal Thomas, Managing Director Mr. K. Santosh George – Executive Director Mr. Preston John Netto, Sr. Executive Fleet Personnel	
Loire Marine Services Pvt. Ltd. Delphi, A – 201/202, Hiranandani Business Park, Powai Mumbai 400 076 Tel. : 2571 2100 Fax : 2571 2133 E-mail : mail@loiremarine.com halbe@loiremarine.com <u>Representatives</u> Capt. S. M. Halbe, Director	W-O Nederland B. V. Sluisjesdijk 141, Portnumber 2128, 3087 AG Rotterdam The Nederland
Maersk India Pvt. Ltd. (Crewing Division) CG House, 8 th Floor, Dr. Annie Besant Road, Worli Colony Mumbai 400 030 Tel. : (D) 2433 7602 / 7603 / 7604 24337878 (B) Fax : 2433 7666 E-mail : asishipbom@maersk.com <u>Representatives</u> Capt Glenn J Saldanha, Senior Manager Mr. Erle Miranda, Manager Ms. Anita Remedios, Senior Executive	A. P. Moller – Maersk A/s, 50, Esplanen, DK-1098, Copenhagen-K, Denmark.
- do -	A. P. Moller Singapore Pte. Ltd., 200, Cantonment Road, 11-00, Southpoint, Singapore 089763.
- do -	The Maersk Company (IOM) Ltd., Portland House, Station Road, Ballasalla, Isle of Man, British Isles IM9 2RB
MSC Ship Management (India) Pvt. Ltd. 7 th floor, Esperenca Building, Shahid Bhagat Singh Road, Colaba, Mumbai 400 039.	MSC Ship Management (HK) Ltd. 45/F, The Center, 99 Queens Road Central, Hong Kong

Name and Address of Agents	Name and Address of Principals
Tel. : 5552 2555 Fax : 5552 2525 E-mail : mumbai@indom.mscshipmgt.com <u>Representatives</u> Capt. Nitin Hardi, Director	Tel. : 41-22 703 8888 Fax : 41 22 703 8787 E-mail/Web Site : www.mscgva.ch
Northern Marine Management (India) Pvt. Ltd., Office Unit No. 301 & 302, 3rd Floor, "B" Wing, Delphi, Orchard Avenue Hiranandani Business Park, Powai Mumbai 400 076 Tel : 5551 5200 Fax : 5551 5300 Email : ctsmumbai@stena.com : hirn@chevrontexaco.com nand.hiranandani@stena.com surinder.kundra@stena.com <u>Representatives</u> Capt. N. A. Hiranandani, Director- International Marine manning Mr. S. K. Kundra, General Manager	Chevron Manning Services Ltd., Chevron House, 11 Church St., Hamilton, Bermuda, HM HX
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Name and Address of Agents	Name and Address of Principals
<u>Representatives</u> Capt. Nalin B. Pandey, Managing Director Capt. B.A.Y. Mukadam, Sr. Crew Manager	
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- do -	Motia Compagnia Di Navigazione S. p. A. Via Vespucci 1, 30173, Mestre (VE)
Seaking International, 515/516, Rex Chambers 5 th Floor, Walchand Hirachand Marg, Ballard Estate, Mumbai 400 001. Tel. : 22644389 / 90 Fax : 22644392 E-mail : seakingintl@vsnl.net <u>Representatives</u> Mr. Vijay Nair, Partner Mr. Gopal Nair, Partner	ETA Ship Management Company Limited "BUHARIA TOWERS", No. 4, Moores Road Chennai 600 006
SNP Shipping Services Pvt. Ltd., Suite No. 2, 2 nd Floor, Kartar Bhavan, 121, Shahid Bhagat Singh Road, Colaba, Mumbai 400 005. Tel. : 22836409 / 22835998 / 228755535 / 22840164 Fax : 22874836 / 22850018 E-mail : snp@snpship.net <u>Representatives</u> Mr. S. C. Sehgal, Managing Director Capt. Sushil Chedda, Marine Supdt.	Kilmar Worldwide Corporation Panama Hongkong Bank Building, 6 th Floor, Samuel Lewis Ave, Panama, Republic Of Panama

Name and Address of Agents	Name and Address of Principals
SNP Shipping Services Pvt. Ltd., Suite No. 2, 2 nd Floor, Kartar Bhavan, 121, Shahid Bhagat Singh Road, Colaba, Mumbai 400 005	Eurosud Management S.A., Hong Kong Bank Building, 6 th Floor, Samuel Lewis Ave, P.O. Box 6-4298, El-Dorado, Panama City, Republic Of Panama
- do -	Dawnbridge Maritime Corporation Hong Kong Bank Building, 6 th Floor Samuel Lewis Ave, PO Box 4298 El Dorado, Republic Of Panama
- do -	Sea Lion Ship Management Private Ld. Suite No. 4, 1 st Floor, Kartar Bhavan, 121, Shahid Bhagat Singh Road, Colaba, Mumbai 400 005.
Sea Lion Ship Management Private Ld. Suite No. 4, 1 st Floor, Kartar Bhavan, 121, Shahid Bhagat Singh Road, Colaba, Mumbai 400 005.	Hillshire International Inc., Hong Kong Bank Building, 6 th Floor Samuel Lewis Ave, P. O. Box 6-4298 El-Dorado, Panama City Republic of Panama
- do -	Marvier Properties S. A., Hong Kong Bank Building, 6 th Floor Samuel Lewis Ave, P. O. Box 6-4298 El-Dorado, Panama City Republic of Panama
- do -	Sanibel Maritime Inc. Edificio Torre Universal Avenida Federico Boyd, Piso 12 (Penthouse), Panama Republic of Panama
- do -	Henter Business Corp. Panama, Edificio Eastern, 12 th Floor, Avenue Federico Boyd, Panama City, Republic of Panama
- do -	Neguel Shipping Inc. Edificio Eastern, 12 th Floor, Avenue Federico Boyd, Panama City, Republic of Panama
- do -	Attal Navigation S. A. 80, Broad Street, Monrovia, Liberia
Tecto India Pvt. Ltd., 14, Olympus, 1 st Floor, 179, Perin Nariman Street, Fort, Mumbai 400 001.	

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Univan Ship Management Ltd., 1207, Regent Chambers, 12th Floor, Nariman Point, Mumbai 400 021. Tel. : 22853508 to 10 Fax : 22853511 E-mail : univanmumbai@hathway.com <u>Representatives</u> Mr. Subrat Mukherjee, Engineer Superintendent Mr. A. K. Jha	Univan Ship Management Ltd., Suite 801, 8th Floor, Asian House, 1, Hennessy Road, Wanchai, Hong Kong
Worldwide Ship Management Pvt. Ltd. # 302, "A" Wing, Galleria, Hiranandani Gardens, Powai Mumbai 400 076 Tel. : 2570 4425 / 2570 4426 / Fax : 2570 2870 Extn. 33 E-mail : mumbai@wwshipmgt.com <u>Representatives</u> Capt. Austin Miranda, Director Mr. Pradeep Arora, Director	Therica Shipping Corporation 14/F, Allied Kajma Building, 138, Gloucester Road, Wanchai, Hong Kong.