Q.P. Code: 00006407

[Time:2.30 Hrs] **[Marks:75]**

Please check whether you have got the right question paper.

N.B:
1. All question are compulsory.
2. Figures to the right indicate full marks.
3. Students answering in the regional language should refer in case of doubt to the main text of the paper in English.

Q.1 Answer the following questions. (ANY THREE) **(15)**

A. Let A={5,7,9}, B={2,3}. Find cartesian product AxB, AxA, BxA, BxB.

B. Use truth tables to show the logical equivalence of the statement forms **p↔q** and **(p∧q) V (~p∧~q~).**

C. What is set? Define any 4 types of sets with example.

D. Let A = {c, d, f, g}, B = {f, j}, and C = {d, g}. Answer each of the following questions. Give reasons for your answers.
i. Is $B \subseteq A$?
ii. Is $C \subseteq A$?
iii. Is $C \subseteq C$?
iv. Is C a proper subset of A?

E. If A,B,C are the sets for the letters in words 'COLLEGE', 'MARRIAGE', and 'LUGGAGE' respectively. Verify : A – (BUC) = (A-B)∩(A-C).

F. What is ordered pair? When we say two ordered pairs are equal? If (x-1, y+4)=(3,5) find the value of x and y.

Q.2 Answer the following questions. (ANY THREE) **(15)**

A. Prove that for all integers n, $n^2 - n + 3$ is odd.

B. Show that the sum of any two rational numbers is rational.

C. Prove that $6+\sqrt{2}$ is irrational.

D. Define Universal Quantifier and Existential Quantifier with example.

E. Prove that "If an integer n is odd, then 5n-2 is odd".

F. Prove that for all integers m and n, m + n and m – n are either both odd or both even.

Q.3 Answer the following questions. (ANY THREE) **(15)**

A. Prove that 7n – 1 is divisible by 6, for each integer $n \geq 0$

B. Find the first four terms of each of the recursively defined sequence
$S_k = S_{k-1} + 2S_{k-2}$, for all integers $k \geq 2$ $S_0 = 1$, $S_1 = 1$

C. Consider, $a_n = a_{n-1} + a_{n-2} + a_{n-3}$, $n \geq 3$ with initial condition $a_0 = a_1 = a_2 = 1$. Prove that $a_n \leq 2^{n-1}$.

D. Define g: Z → Z by the rule g(n) = 7n − 2, for all integers n.
(i) Is g one-to-one? Prove or give a counter example.
(ii) Is g onto? Prove or give a counter example.

E. Verify whether the function f: N->N defined as f(x)= 9x+2 for all x in N . a) One-one b) Onto. Also find the inverse if function is bijective.

F. Define Fibonacci sequence. Write any four application.

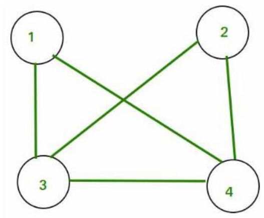
Q.4 Answer the following questions. (ANY THREE) **(15)**

A. Let A={1,2,3,4,5} . R be partial order relation on A defined as aRb <=> a|b. Draw Hass diagram for this relation.

B. Differentiate between Tree and Graph.

C. Show that following relation is an equivalence relation: xRy <=> x-y is an integer for all x,y in integer set.

D. Find all possible spanning graph of the following graph:



E. What is equivalence relation? Define reflexive, symmetric and transitive relation.

F. Let A={1,2,3,4}. Write an equivalence relation R on set A and Its matrix representation R(M).

Q.5 Answer the following questions. (ANY THREE) **(15)**

A. A bag contains 4 balls. Two balls are drawn at random without replacement and are found to be blue. What is the probability that all balls in the bag are blue?

B. A team of four has to be selected from 6 boys and 4 girls. How many different ways a team can be selected if at least one boy must be there in the team?

C. How many triangles can be formed using 10 points in a plane out of which 4 are collinear?

D. Two cards are drawn at random from an ordinary deck of 52 cards. Find the probability that:
(a) both are spades;
(b) one is a spade and one is a heart.

E. Define the following:
a. Event
b. Experiment
c. Probability
d. Addition Probability
e. Multiplication Probability

F. Two cards are drawn at random from an ordinary deck of 52 cards. Find the probability that:(a) both are spades;(b) one is a spade and one is a heart.