

[Time:2 ½ Hours]

[Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. All questions 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 A)** State and prove the following elementary theorem: 10
- i) Probability of complementary event $P(A^c) = 1 - P(A)$.
 - ii) For event A and B; $P(A \cap B^c) = P(A) - P(A \cap B)$.
- B)** Attempt any Two of the following:
- i) What is the probability that in a random arrangement of alphabets of word "CHILDREN". 5
 - (a) All vowels are together. (b) No two vowels are together?
 - ii) A bag contains 4 black and 6 white balls; two balls are selected at random. Find the probability that balls are i) both are different colors. ii) both are of same colors. 5
 - iii) Show that $\{\emptyset, \Omega\}$ is a field. 5
- Q.2 A)** State and prove continuity property of probability. 10
- B)** Attempt any Two of the following: 5
- i) Raj can hit a target 3 times in 5 shots, Ram can hit a target 2 times in d shots and Ravi can hit a target 3 times in 4 shots. If Ram, Raj and Ravi fire simultaneously, find the probability that two shots hit the target. 5
 - ii) An investment consultant predicts that the odds against the price of a certain stock will go up during the next week are 1:2 and the odds in favour of the price remaining the same are 1:3. What is the probability that the price of the stock will go down during the next week? 5
 - iii) The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X, died. What is the chance that his disease was diagnosed correctly? 5
- Q.3 A)** Find the expectation and variance of random variable X has exponential distribution with parameter λ . 10
- B)** Attempt any Two of the following:
- i) If $p(x) = \begin{cases} \frac{x}{15}; & x = 1, 2, 3, 4, 5 \\ 0, & \text{otherwise} \end{cases}$ 5

Find a) $P\{X = 1 \text{ or } 2\}$, and b) $P\{\frac{1}{2} < X < \frac{5}{2} | X > 1\}$.
 - ii) Eight coins are tossed simultaneously. Find the probability of getting atleast six heads. 5

- iii) The average number of incoming telephone calls at a switch board per minute is 2. Find the probability that during a given minute (a) 2 or more calls received, (b) atleast 1 calls received. (Given, $e^{-2} = 0.135$) 5

Q.4 A) State and prove weak law of large number. 10

B) Attempt any Two of the following:

- i) Suppose that the son of a man of height x (in inches) attains a height that is normally distributed with mean $x + 1$ and variance 4. What is the best prediction of the height at full growth of the son of a man who is 6 feet tall? 5
- ii) Suppose that it is known that the number of items produced in a factory during a week is a random variable with mean 50. 5
- (a) What can be said about the probability that this week's production will exceed 75?
- (b) If the variance of a week's production is known to equal 25, then what can be said about the probability that this week's production will be between 40 and 60?
- iii) If (X, Y) be two-dimensional random variable then prove that $E(X + Y) = E(X) + E(Y)$. 5
