

COURSE CODE : MTH302

COURSE TITLE : PROBABILITY AND STATISTICS

Time Allowed: 01:30 hr

Max. Marks: 40

Read the following instructions carefully before attempting the question paper.

1. Match the Paper Code shaded on the OMR Sheet with the Paper code mentioned on the question paper and ensure that both are the same.
2. This question paper contains 40 questions of 1 mark each. 0.25 marks will be deducted for each wrong answer.
3. Do not write or mark anything on the question paper except your registration no. on the designated space.
4. Submit the question paper and the rough sheet(s) along with the OMR sheet to the invigilator before leaving the examination hall.

Q1. Moment generating function of a discrete random variable X with probability mass function $f(x)$ is given by

- a) $xf(x)$ b) $\sum_x e^{tx} f(x)$ c) $\int e^{tx} f(x) dx$ d) $(x-1)f(x)$

Q2. Ten coins are thrown together. The probability of getting at least 7 heads is

- (a) 0.17 (b) 0.23 (c) 0.5 (d) 0.8

Q3. Total area under the curve of a continuous probability density function is always equal to:

- (a) 2 (b) 1 (c) 0 (d) -1

Q4. In binomial distribution where $p+q=1$, probability of success (p) in each trial is

- (a) Constant (b) Different (c) Greater than q (d) Less than q

Q5. The expected value of the random variable

- (a) The most likely value of the random variable. (b) Another term for the mean value
(c) Is also called the variance. (d) Cannot be greater than 1.

Q6. In a discrete probability distribution, the cumulative distribution function $F(x)$ is given by

- (a) $P(X = x)$ (b) $P(X \leq x)$ (c) $P(X \geq x)$ (d) None of the above.

Q7. If in a table, all possible value of a random variable are given their corresponding probabilities, then this table is known as

- a) Probability density function b) Distribution function
c) Probability distribution d) Continuous distribution

Q8. For a discrete random variable X and probability mass function p_x , the value of the expectation of X is

- a) $\sum p_x$ b) $\sum x p_x$ c) $\sum (x + p_x)$ d) $x + \sum p_x$

Q9. Find the expectation of a random variable X if the probability density function is given by $f(x) = ke^{-x}$ for $x > 0$ and 0 otherwise.

- a) 0 b) 1 c) 2 d) 3

Q10. If X and Y are random variables such that $Y \leq X$, then we must have

- a) $E(X) \geq E(Y)$ b) $E(X) \leq E(Y)$ c) $E(X) = E(Y)$ d) $E(X) - E(Y) = 0$

Q11. A family has three children and it is known that it has at least one boy. Assuming that all sex distributions are equally likely, the probability that there are exactly two boys in the family is

- a. $3/8$ b. $3/7$ c. $4/7$ d. $1/2$

Q12. In a book of 500 pages, 50 typographic errors occur. What is the probability that random sample of 10 pages will contain no error?

- a. e^{-2} b. e^{-1} c. e^{-3} d. e^{-4}

$$\frac{5}{50} = \frac{10-1}{10} \cdot 10$$

(etc)

Q13. In a book of 50 pages, 5 typographic errors occur. What is the probability that random sample of 10 pages will contain no error?

a. e^{-2}

b. e^{-1}

c. e^{-3}

d. e^{-4}

Q14. Five coins are tossed, 6400 times in Poisson distribution what is the value of mean

a. 200

b. 100

c. 400

d. 800

$$e^{3200}$$

$$n \times \frac{1}{2} = \frac{6400}{2} = 3200$$

Q15. In normal distribution with mean 25 and variance 25, if $X = 30$ then

a. $Z = 20$

b. $Z = \frac{1}{5}$

c. $Z = 10$

d. $Z = 1$

$$Z = \frac{30 - 25}{\sqrt{25}} = \frac{5}{5} = 1$$

Q16. In binomial distribution, which of the following is true?

(a) Mean = variance

(b) Mean > variance

(c) Mean < variance

(d) None of these

Q17. Variance in Binomial distribution is:

(a) np

(b) npq

(c) pq

(d) np²

Q18. Which distribution belongs to discrete random variable?

a) Binomial distribution

b) Normal distribution

c) Exponential distribution

d) None of above

Q19. The probability mass function of binomial distribution is:

a) $P(X=r) = nC_r p^r q^{n-r}; r = 0, 1, 2, 3 \dots$

b) $P(X=r) = nC_{r-1} p^r q^{n-r}; r = 0, 1, 2, 3 \dots$

c) $P(X=r) = n - 1C_{r-1} p^r q^{n-r}; r = 0, 1, 2, 3 \dots$

d) $P(X=r) = p^r q^{n-r}; r = 0, 1, 2, 3 \dots$

Q20. In normal distribution the curve $f(x)$ is symmetric with respect to

(a) $x = 2\sigma$

(b) $x = \mu$

(c) $x = \frac{11}{\sigma}$

(d) none of these

Q21. If A and B are independent events then

(a) $P(A/B) = P(A) \cdot P(B)$

(b) $P(A/B) = P(B)$

(c) $P(A/B) = P(A)$

(d) none of these

Q22. Which of the following statement is false? if $P(A) \neq 0$

(a) $P(B/A) \geq 0$

(b) $P(A/A) = 1$

(c) $P(B/A) \geq P(B)$

(d) $P(B/A) = P(B) / P(A \cup B)$

Q23. When a card is drawn from the pack of cards. The probability of getting red card is

(a) 3

(b) 1

(c) $\frac{1}{4}$

(d) $\frac{1}{2}$

Q24. Let X be a random variable, then

(a) $\text{Var}(5X+3) = 25\text{Var}(X) + 9$

(b) $\text{Var}(5X+3) = 5\text{Var}(X) + 3$

(c) $\text{Var}(5X+3) = 25\text{Var}(X)$

(d) $\text{Var}(5X+3) = 5\text{Var}(X) + 9$

Q25. Variance of a random variable X is given by

a) $E(X)$

b) $E(X^2)$

(c) $E(X^2) - (E(X))^2$

d) $(E(X))^2$

Q26. A fair coin is tossed three times. Find the probability of getting atmost one head and two consecutive heads.

(a) $\frac{1}{2}, \frac{1}{3}$

(b) $\frac{1}{3}, \frac{1}{4}$

(c) $\frac{1}{2}, \frac{1}{4}$

(d) $\frac{1}{2}, -\frac{3}{4}$

Q27. The probability that a man can hit a target is $\frac{3}{4}$. He tries 5 times. The probability that he will hit the target atleast three times is

- (a) $\frac{291}{364}$ (b) $\frac{371}{464}$ (c) $\frac{471}{502}$ (d) $\frac{459}{512}$

Q28. The probability of getting qualified in IIT-JEE and AIEEE by a student are respectively $\frac{1}{5}$ and $\frac{3}{5}$. The probability that the student gets qualified for one of these tests is

- (a) $\frac{3}{25}$ (b) $\frac{17}{25}$ (c) $\frac{22}{25}$ (d) $\frac{8}{25}$

Q29. The odds against an event A are 5:2 and odds in favour of another independent event B are 6:5. The chances that neither A nor B occurs is

- (a) $\frac{52}{77}$ (b) $\frac{25}{77}$ (c) $\frac{10}{77}$ (d) $\frac{12}{77}$

Q30. We have a biased die such that, each even number is twice likely to occur for odd number. What is the probability of getting a number greater than 3, in a single roll of die?

- (a) $\frac{4}{9}$ (b) $\frac{5}{9}$ (c) $\frac{3}{9}$ (d) $\frac{1}{9}$

Q31. Suppose three unbiased coins are tossed. What is the probability of getting at least 2 tails?

- a) $\frac{1}{3}$ b) $\frac{1}{6}$ c) $\frac{1}{2}$ d) $\frac{1}{8}$

Q32. What is the probability of correctly choosing an unknown integer between 0 to 9 within three chances?

- (a) $\frac{963}{1000}$ (b) $\frac{973}{1000}$ (c) $\frac{983}{1000}$ (d) None of these

Q33. If probabilities that A and B will die within a year are p and q respectively, then probability that only one of them will be alive at the end of the year is

- (a) pq (b) p(1-q) (c) q(1-p) (d) p + q - 2pq

Q34. If $P(A) = \frac{3}{4}$ and $P(B) = \frac{5}{8}$, then

- (a) $P(A \cup B) \geq \frac{3}{4}$ (b) $\frac{3}{8} < P(A \cap B) \leq \frac{5}{8}$ (c) $\frac{1}{8} \leq P(A \cap \bar{B}) \leq \frac{3}{8}$ (d) All of these

Q35. These houses are available in a locality 3 person apply for the houses. Each applies for one house without consulting others. The probability that all the three apply for the same house is

- (a) $\frac{2}{9}$ (b) $\frac{1}{9}$ (c) $\frac{8}{9}$ (d) $\frac{7}{9}$

Q36. Find the expectation and variance of X?

x	0	1	2	3	4
f(x)	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9}$	$\frac{2}{9}$	$\frac{1}{9}$

a) 2, $\frac{4}{3}$ b) 3, $\frac{4}{3}$ c) 2, $\frac{2}{3}$ d) 3, $\frac{2}{3}$

Q37. The expected value of a random variable is equal to its

- (a) Mean (b) Standard deviation (c) Variance (d) Co-variance

Q38. The random variables X and Y have variances 0.2 and 0.5 respectively. Let $Z = 5X - 2Y$. The variance of Z is

- (a) 7 (b) 3 (c) 4 (d) 5

Q39. Given that X is a random variable and $E(X) = \frac{11}{4}$. Then $E(8X + 5)$ is

- a) 23 b) 27 c) 32 d) 37

Q40. Two fair six-sided dice are thrown simultaneously. If X denotes the number of fours, then the value of $E(X)$ is

- a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{1}{6}$ d) $\frac{2}{3}$

-- End of Question Paper --