

b. Find the value of \bar{X}, \bar{Y}, b_{xy} and b_{yx} from the following data.

| | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|
| X: | 25 | 28 | 35 | 32 | 31 | 36 | 29 | 38 | 34 | 32 |
| Y: | 43 | 46 | 49 | 41 | 36 | 32 | 31 | 30 | 33 | 39 |

PART – C (1 × 15 = 15 Marks)

Answer ANY ONE Question

Marks BL CO PO

26. Given the following probability distribution of X, compute $E(X), E(X^2), E(2X+3)$.

| | | | | | | | |
|-------|------|------|------|---|------|------|------|
| X: | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
| P(X): | 0.05 | 0.10 | 0.30 | 0 | 0.30 | 0.15 | 0.10 |

27. Find the correlation coefficient for the following data:

| | | | | | | |
|----|----|----|----|----|----|----|
| X: | 10 | 14 | 18 | 22 | 26 | 30 |
| Y: | 18 | 12 | 24 | 6 | 30 | 36 |

8 3 5 2

Reg. No.

B.Tech. / M.Tech (Integrated) DEGREE EXAMINATION, MAY 2023
Fourth Semester

21MAB304T – PROBABILITY AND APPLIED STATISTICS
(For the candidates admitted from the academic year 2021 - 2022 & 2022 - 2023)
(Graph sheets and statistical tables should be given)

Note:

- Part - A should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
- Part - B and Part - C should be answered in answer booklet.

Time: 3 Hours

Max. Marks: 75

PART – A (20 × 1 = 20 Marks)
Answer ALL Questions

Marks BL CO PO

- $P(\bar{A}) =$ _____
(A) $1 - P(A)$ (B) U
(C) \emptyset (D) $P(A)$
- $P(\emptyset) =$ _____
(A) 0 (B) 1
(C) -1 (D) ∞
- The value of 'k' in $f(x) = kx^2 e^{-x} dx$ $0 < x < \infty$ is _____
(A) 1 (B) -1/2
(C) 1/2 (D) 0
- $E[aG(x)] =$ _____
(A) 1 (B) $aE[G(x)]$
(C) $a^2 E[G(x)]$ (D) $E[G(x)]$
- The mean and variance of binomial distribution is _____
(A) np, pq (B) nq, np
(C) np, npq (D) pq, nq
- Poisson distribution is a limiting case of _____
(A) Binomial distribution (B) Exponential distribution
(C) Normal distribution (D) Uniform distribution
- Mean of uniform distribution is _____
(A) $a+b$ (B) $a-b$
(C) $\frac{a+b}{2}$ (D) $\frac{a-b}{2}$
- Variance of exponential distribution is _____
(A) $1/\lambda^2$ (B) $1/\lambda$
(C) λ (D) λ^2

9. An estimator is said to be best if it is _____
 (A) Unbiased (B) Biased
 (C) Inconsistent (D) Non efficient
10. If X and Y are random variables such that $EY = \mu$ and $\text{Var } Y = \sigma_y^2$ let $E(Y/X) = \phi(x)$, then $E(\phi(x)) =$ _____
 (A) $\phi(x)$ (B) μ
 (C) $E(Y)$ (D) $E(X)$
11. According to the principle of maximum likelihood, the estimator of the likelihood function is chosen to be _____
 (A) Maximum (B) Minimum
 (C) Equal (D) Zero
12. If T_n is a consistent estimator of $\gamma(\phi)$ and $\psi\{\gamma(\phi)\}$ is a continuous function of $\gamma(\phi)$, then $\psi\{\gamma(\phi)\}$ is a _____ estimator.
 (A) Consistent (B) Inconsistent
 (C) Good (D) Sufficient
13. A _____ is a subset of a _____
 (A) Parameter, statistic (B) Statistic, parameter
 (C) Sample, population (D) Statistic, sample
14. Students 't' test is a _____ distribution.
 (A) Bimodal (B) Unimodal
 (C) Normal (D) Exponential
15. The Chi-square test is not very effective if the sample is _____
 (A) Large (B) Small
 (C) Regular (D) Irregular
16. F-statistic is defined by
 (A) $F = \frac{S_1^2}{S_2^2}$ (B) $F = \frac{S_1^3}{S_2^2}$
 (C) $F = \frac{S_1^2}{S_2^3}$ (D) $F = \frac{S_1}{S_2^3}$
17. If $r=0$, the two variables X and Y are
 (A) Uncorrelated (B) Perfect correlated
 (C) Perfect positive correlation (D) Perfect negative correlation
18. In two way ANOVA classification the data are classified to any of _____ criterion.
 (A) One (B) Two
 (C) Five (D) Six
19. The range of simple correlation coefficient is _____
 (A) 0 to ∞ (B) $-\infty$ to ∞
 (C) 0 to 1 (D) -1 to +1

20. If $b_{xy} = \frac{18}{40}$ $b_{yx} = \frac{8}{10}$ then $r^2 =$ _____
 (A) 25/9 (B) 9/25
 (C) 16/25 (D) 25/16

PART - B (5 × 8 = 40 Marks)
 Answer ALL Questions

21. a.i. If $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$ and if A, B are independent; find $P(A \cap B)$.
 ii. If $P(A) = 0.9$ and $P(B/A) = 0.8$, find $P(A \cap B)$.
- (OR)
- b. A random variable 'X' has the probability density function given by
 $f(x) = \begin{cases} 2e^{-2x}, & x \geq 0 \\ 0, & x < 0 \end{cases}$. Find the moment generating function.
22. a. In 256 sets of 12 tosses of a coin, how many cases may one expect eight heads and four tails using binomial distribution.
- (OR)
- b. Find the moment generating function of exponential distribution.
23. a. If x_1, x_2, \dots, x_n are random observations on a Bernoulli variable X taking the value 1 with probability θ and the value 0 with probability $1-\theta$. Show that $\frac{1}{n} \sum_{i=1}^n x_i$ is an unbiased estimator of θ^2 , where $T = \sum_{i=1}^n x_i$.
- (OR)
- b. State and prove Rao-Blackwell theorem.
24. a. Two horses A and B were tested according to the time (insec) to run a particular track with the following results.
 Horse A : 28 30 32 33 33 29 34
 Horse B : 29 30 30 24 27 27
 Test whether you can discriminate between the two horses using 't' test.
- (OR)
- b. The following table gives the number of aircraft accidents that occurred during the various days of the week. Test whether the accidents are uniformly distributed over the week using Chi-square test.
- | Days | Mon | Tue | Wed | Thurs | Fri | Sat |
|-----------------|-----|-----|-----|-------|-----|-----|
| No. of Students | 14 | 18 | 12 | 11 | 15 | 14 |
25. a. Find the Spearman's rank correlation coefficient from the following data:
- | | | | | | | | |
|-----------|---|---|---|---|---|---|---|
| Rank in X | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Rank in Y | 4 | 3 | 1 | 2 | 6 | 5 | 7 |
- (OR)