

KAMARAJ COLLEGE (Autonomous)

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(Affiliated to Manonmaniam Sundaranar University, Tirunelveli)

(4 Pages)

Reg. No:.....

Question Code: 26E00209

Course Code : 24UEMA41

UG Degree - End Semester Examinations, April 2026

Fourth Semester
B.Sc., MATHEMATICS

Statistics - II

(For those who joined in July 2024 onwards)

Time : 3Hours

Maximum : 75 Marks

PART - A (10 × 1 = 10 Marks)

Answer ALL Questions

Choose the correct answer :

- CO:1
K:1
1. A discrete random variable can take integer values from 1 to 6 each with probability $1/6$, then the mean value is _____.
- (a) k (b) $k/2$
(c) $7/2$ (d) 3
- CO:1
K:2
2. If $f(x) = kx^2$, $0 < x < 3$, is a probability function, then the value of 'k' is _____
- (a) $1/9$ (b) 2
(c) $3/2$ (d) $4/5$
- CO:2
K:1
3. The characteristic function of binomial distribution is _____.
- (a) $(q+pe^{it})$ (b) $(q+e^{it})^n$
(c) $(q-pe^{it})^n$ (d) $(q+pe^{it})^n$
- CO:2
K:2
4. If X has a Poisson distribution and $P(X=0) = P(x=1) = k$, then the value of λ is _____.
- (a) 1 (b) $1/e$
(c) 0 (d) E
- CO:3
K:1
5. The mode of the normal distribution is ____.
- (a) $x=\mu$ (b) $x=0$
(c) $x=1$ (d) $x=\infty$
- CO:3
K:1
6. The gamma function is defined by _____.
- (a) $\Gamma(p) = \int_0^1 x^{p-1} e^{-x} dx, p < 0$
(b) $\Gamma(p) = \int_0^\infty x^{p-1} e^x dx, p > 0$

$$(c) \Gamma(p) = \int_0^{\infty} x^p e^{-x} dx, p > 0$$

$$(d) \Gamma(p) = \int_0^{\infty} x^{p-1} e^{-x} dx, p > 0$$

CO:4 7. The probability level below which we reject a null hypothesis is
K:1 called the _____.

- (a) Level of significance (b) Critical region
(c) Single tailed (d) Two tailed

CO:4 8. A normal population has mean 100 and variance 64. In a sample
K:2 of size 400 mean is 99. Then the value of test statistics is
 $|Z| = \underline{\hspace{2cm}}$.

- (a) 2 (b) 2.5
(c) 0.4 (d) -2.5

CO:5 9. To test the goodness of fit, the test statistic used is _____.

- K:1 (a) $|Z| = \frac{x - \mu}{\sigma}$ (b) $|Z| = \frac{x - \mu}{\sigma + n}$
(c) $\chi^2 = \frac{(o_i - e_i)^2}{e_i}$ (d) $\chi^2 = \frac{(o_i e_i)^2}{2e_i/n}$

CO:5 10. If $\sigma = 8$, $s=10$ and $n = 51$, then the test statistics χ^2 is _____

- K:2 (a) 55 (b) 79.7
(c) 10 (d) 0.87

PART - B (5 X 5 = 25 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 250 words.

CO:1 11. (a) If X is a continuous random variable with probability
K:3 density function $f(x) = \frac{x+2}{8}$, $-2 < x < 4$ then compute

(i) $P(|X| < 1)$ and (ii) $P(X^2 < 9)$

(OR)

(b) A random variable X has the probability function
 $P(x) = \frac{1}{2^x}$; $x=1,2,3,\dots$. Find its (i) m.g.f. and (ii) mean

CO:1 12. (a) A discrete random variable X has the mean 6 and variance
K:3 2. If it is assumed that the distribution is binomial,
find (i) $P(5 \leq X \leq 7)$ and $P(X \geq 1)$.

(OR)

(b) Between the hours 2.p.m and 4.p.m, the average number of phone calls per minute coming into the switch board of a company is 2.35. Find the probability that during one particular minute there will be atmost 2 phone calls.

CO:2 13. (a) Compute the mode of the Normal distribution.

K:4

(OR)

(b) Determine the points of inflexion of the normal curve.

CO:3 14. (a) A machine puts out 16 imperfect articles in a sample of 500 articles. After the machine is overhauled it puts out 3 defective articles in a sample of 100. Has the machine improved?

K:3

(OR)

(b) The number of accidents per days were studied for 144 days in Madras city and for 100 days in Delhi city. The mean number of accidents and s.ds were respectively 4.5 and 1.2 for Madras city and 5.4 and 1.5 for Delhi city. Is Madras city more prone to accidents than Delhi city?

CO:4 15. (a) In a certain sample of 2000 families 1400 people are consumers of tea. Out of 1800 Hindu families, 1236 families consume tea. Use chi-square test and state whether there is any significant difference between consumption of tea among Hindu and Non-Hindu families.

K:4

(OR)

(b) A random sample of size 25 from a population gives the sample standard deviation 8.5. Test the hypothesis that the population is s.d is 10.

PART - C (5 X 8 = 40 Marks)

Answer ALL Questions choosing either (a) or (b).

Answer should not exceed 500 words.

CO:1 16. (a) The probability function of a continuous random variable X

K:3

is given by $f(x) = \begin{cases} x & \text{if } 0 < x \leq 1 \\ 2 - x & \text{if } 1 \leq x < 2 \\ 0 & \text{if } x \geq 2 \text{ and } x \leq 0 \end{cases}$. Find the

distribution function of X.

(OR)

(b) Obtain the r^{th} moment and r^{th} cumulant for the distribution $f(x) = ce^{-cx}$, where c is positive and $0 \leq x < \infty$.

CO:2 17. (a) Obtain the m.g.f of the binomial distribution and hence also find the central moments μ_2 , μ_3 and μ_4 .

K:4

(OR)

(b) Derive the recurrence relation for the central moments for Poisson distribution.

- CO:3 K:2 18. (a) If X is normally distributed with mean 8 and S.D 4 find
 (i) $P(5 \leq X \leq 10)$ (ii) $P(X \geq 15)$
 (iii) $P(X \leq 5)$ and(iv) $P(|X - 5|) \leq 1$.

(OR)[

- (b) A set of examination marks is approximately distributed with mean 75 and S.D of 5. If the top 5% of students get grade A and the bottom 25% get grade B. What mark is the lowest A and what mark is the highest B?

- CO:4 K:5 19. (a) A cigarette manufacturing firm claims that its brand A cigarette outsells its brand B cigarette by 8%. It is found that 42 out of a sample of 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B. Test whether the 8% is difference is a valid claim.

(OR)

- (b) The mean yields of rice from two places in a district were 210kgs and 220kgs per acre from 100 acres and 150acres respectively. Can it be regarded that the samples were drawn from the same district which has the s.d of 11kgs per acre?

- CO:5 K:6 20. (a) Five coins are tossed 320 times. The number of heads observed is given below. Examine whether the coin is unbiased.

No.of heads	0	1	2	3	4	5	Total
Frequency	15	45	85	95	60	20	320

(OR)

- (b) Investigate from the following data between inoculation against small pox and prevention from attack.

	Attacked	Not attacked	Total
Innoculated	25	220	245
Not innoculated	90	160	250
Total	115	380	495

Use Chi-square test to test the effectiveness of inoculation in preventing the attack of small pox.