Question Paper Code:U3M21

B.E./B.Tech. DEGREE EXAMINATION, NOV 2024

Third Semester

Mechanical Engineering

21UMA321-Probability, Statistics & Partial Differential Equations

(Regulation 2021)

Duration: Three hours   Maximum: 100 Marks

Answer All Questions

PART A - (10x 1 = 10Marks)

1. The degrees of freedom in t-tests is   CO6-U

    (a) n-1   (b)n-2   (c) n-3   (d)n-4

2. Chi-square test is very popularly known as a test of   CO6- U

    (a) Independent of attributes   (b) t- test

    (c) F-test   (d) goodness of fit

3. Latin square design is a _____   CO6- U

    (a) One way   (b) Two way   (c) Three way   (d) None of these

4. Choose the correction factor_____   CO6- U

    (a) T^2N (b)T/N   (c)T^2/N (d) 0

5. The limiting form aBinomial distribution is   CO6- U

    (a) Geometric   (b)Poisson   (c) Normal   (d) None of the above

6. If X and Yare independent random variables thenCov(X ,Y) is   CO3- App

    (a) 0   (b) 1   (c) -1   (d) ∞

7. The particular integral of $(D^2 -4DD' +3D'^2) z = e^{x+y}$ is _____   CO3- App

    (a) $\frac{xe^{x+y}}{2}$ (b) $-\frac{xe^{x+y}}{2}$ (c) $\frac{x^2e^{x+y}}{2}$ (d) $\frac{-x^2e^{x+y}}{2}$

8. The general solution of $(D^2 - 8DD' + 12D'^2) z = 0$ is _____   CO4- App

    (a) $f_1 (y + 2x) + f_2 (y+6 x)$ (b) $f_1 (y + 2x) + f_2 (y-6x)$

    (c) $f_1 (y -2x) + f_2 (y-6x)$ (d) $f_1 (y + 2x) + f_2 (y-6x)$

9. Classify the equation $u_{xx}+u_{yy} = 0$ is _____   CO6- U

    (a) parabolic   (b) hyperbolic   (c) elliptic   (d) cyclic

10. $Au_{xx}+Bu_{xy}+Cu_{yy} = f(x, y)$ is parabolic if_____.   CO5- U

    (a) $B^2-4AC<0$ (b) $B^2-4AC= 0$ (c) $B^2-4AC>0$ (d) $B^2-4AC\neq0$

PART – B (5 x 2= 10Marks)

11. Write the conditions for the application of Chi-square Test   CO1- U

12. For a one way classification on 12 observations involving 3 treatments the sum of squares of treatment and sum of squares of total are 8 and 36 respectively, compute the value of the F – ratio.   CO2- App

13. A continuous random variable has the probability density function is given by $f(x)= Kx(1- x), 0 < x <1$, Compute the value of the constant 'K'.   CO3- App

14. Compute the complete integral of $p - q = k$ CO4- App

15. Classify $8u_{xx} - 5u_{xy} + u_{yy} = 0$ CO5- App

PART – C (5 x 16= 80Marks)

16. (a)   (i) The theory predicts the population of beans in the four groups A, B, C and D should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory?   CO1-Ana   (8)

       (ii) In one sample of 10 observations the sum of the squares of the deviations of the sample values from the sample mean was 120 and another sample of 12 observations it was 314, Test whether the difference significant at 5% level of significance.   CO1-Ana   (8)

                                      Or

    (b)   (i) Two horses A and B were tested according to time (in seconds) to run on a particular track with the following results: CO1 -Ana   (8)

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	

       Identify the sampling distribution, test whether horse A is running faster than B at 5% level

(ii) In one sample of 8 observations the sum of the squares of the deviations of the sample values from the sample mean was 84.4 and another sample of 10 observations it was 102.6, Test whether the difference significant at 5% level of significance.   CO1 -Ana   (8)

17. (a) Analyze the following of Latin square design experiment.   CO2 -Ana   (16)

A (12)	D (20)	C (16)	B (10)
D (18)	A (14)	B (11)	C (14)
B (12)	C (15)	D (19)	A (13)
C (16)	B (11)	A (15)	D (20)

Or

(b) A completely randomized design experiment with 10 plots and 3 treatments gave the following results: CO2 -Ana   (16)

Plot No	1	2	3	4	5	6	7	8	9	10
Treatment	A	B	C	A	C	C	A	B	A	B
Yield	5	4	3	7	5	1	3	4	1	7

18. (a) (i)Obtain the Correlation coefficient for the following heights (in inches) of fathers X and their sons Y.   CO3- App   (8)

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

(ii) The number of monthly breakdowns of a computer is a R.V. having a Poisson distribution with mean equal to 1.8. Find the Probability that his computer will function for a month (a) Without a breakdown (b) With only one breakdown (c) With at least one breakdown.   CO3- App   (8)

Or

(b) (i) In a large consignment of electric bulbs 10 % are defective. A random sample 20 bulbs are taken for inspection. Find the probability that (i) all are good bulbs (ii) exactly three defective bulbs   CO3- App   (8)

(ii)Using the probability mass function of exponential distribution , Compute the moment generating function and hence find mean and variance   CO3-App   (8)

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19. (a) (i) Solve $(D^2 - DD^1 - 2D^{1^2})z = e^{3x+4y} + \cos(x+y)$ CO4-App (8)

(ii) Solve $x(z^2 - y^2)p + y(x^2 - z^2)q = z(y^2 - x^2)$ CO4-App (8)

Or

(b) (i) Solve $Z = px + qy + \sqrt{pq}$ CO4 -App (8)

(ii) Form a P.D.E by eliminating arbitrary functions from $f(x^2 + y^2 + z^2, x + y + z)$ CO4 -App (8)

20. (a) A bar of 10cm long with insulated sides has its ends A and B kept at 0° c and 100^oc respectively. Until steady state condition prevails. The temperature at A is then suddenly raised to 20^oc and at the same instant B is lower to 80^oc and maintained thereafter. Find the subsequent temperature distribution in the bar. CO5- App (16)

Or

(b) A String is stretched and fastened to two points l apart .Motion is started by displacing the Velocity $\lambda (lx\text{-}x^2)$ from which it is released at t=0.Find the displacement of any point at a distance 'x' at any time 't'. CO5- App (16)

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