A

Question Paper Code: 93021

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

Third Semester

Mechanical Engineering

19UMA321- Probability, Statistics & Partial Differential Equations

(Regulation 2019)

Duration: Three hours   Maximum: 100 Marks

Answer All Questions

PART A - (10x 1 = 10 Marks)

1. Large sample size is   CO6- U

    (a) 30   (b)>30   (c)<30   (d) none of these

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. If F 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^2 (b)T/N   (c)T^2/N (d) 0

5. The limiting form a Binomial distribution is   CO6- U

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

6. For a binomial distribution mean is 6 and S.D is $\sqrt{2}$ then P   CO3- App
    is___

    (a) $\dfrac{2}{3}$ (b)$\dfrac{1}{3}$ (c)$\dfrac{5}{3}$ (d) $\dfrac{2}{5}$

7. The PDE obtained from z = (x+a)(y+b) is __.   CO4- App

    (a) 3z = px + qy   (b)py - qx = 0   (c)3z = px + qy   (d) py - qx = 0

8. The particular integral of $(D^2 - 4DD' + 3D'^2) z = e^{x+y}$ is _____   CO4- App

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

9. An insulated rod of length 60 cm has its ends at A and B kept at $20^{o}C$ and   CO6- U
$80^{o}C$ respectively, then its steady state solution is

(a) x-20   (b) 4x+20   (c) x+20   (d) x+60

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) $B^2-4AC\neq 0$

<div align="center">PART – B (5 x 2= 10Marks)</div>

11. Explain Null Hypothesis.   CO1- App

12. Why a 2*2 Latin square is not possible? Explain   CO2- App

13. If a random variable has the moment generating function given by   CO3- App

$M_x(t) = \dfrac{2}{2-t}$, determine the variance of X

14. Find the complete integral of $p - q = 1$ CO4- App

15. Solve $(D^2 - 2DD'^1 + 2D'^{1^2})Z = 0$ CO5- App

<div align="center">PART – C (5 x 16= 80Marks)</div>

16. (a)   (i) A group of 10 rats fed on a diet A and another group of 8 rats   CO1-Ana   (8)
fed on diet B recorded the following increase in weighs.

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	10	1	2	8		

Find if the variances are significantly difference.

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

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

Test whether horse A is running faster than B at 5% level using t-
test

<div align="center">Or</div>

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(b) (i) The table gives the number of aircraft accidents that occurred CO1 -Ana (8)
during the various days of the week. Test whether the
accidents are uniformly distributed over the week.

Days	Mon	Tue	Wed	Thu	Fri	Sat
No.of. accidents	14	18	12	11	15	14

(ii) A die is thrown 264 times with the following results. Show CO1 -Ana (8)
that the die is biased

No. appeared on the die	1	2	3	4	5	6
Frequency	40	32	28	58	54	52

17. (a) Analyse the following is a Latin square of a design. CO2 -Ana (16)

A 105	B 95	C 125	D 115
C115	D 125	A 105	B 105
D 115	C 95	B 105	A 115
B 95	A 135	D 95	C 115

Or

(b) The following data represent the number of units of production CO2 -Ana (16)
per day turned out by 5 different workers using 4 different types
of machines. Analyse the data

		Machine Type			
		A	B	C	D
Workers	1	44	38	47	36
	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

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18. (a) (i) Find the moment generating function and hence find mean and CO3- App (8)
variance for the Poisson distribution

(ii) Find the moment generating function of the random variable CO3- App (8)
X whose probability function $P[X = x] = \dfrac{1}{2^x}; x = 1,2,3....$ and hence

find it's mean and variance.

Or

(b) (i) Find the mgf of the random variable X whose probability CO3- App (8)
density function is given by $f(x) = 2e^{-2x}; x \geq 0$ .and hence find it's
mean and variance.

(ii) The cumulative distribution function of a random variable X CO3-App (8)
is $F(x) = 1 - (1+x)e^{-x}, x > 0$. Find the probability density function
of X, mean and variance

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

(ii) Solve $(mz - ny)p + (nx - lz)q = ly - mx$ CO4-App (8)

Or

(b) (i) Solve $Z = px + qy + p^2 - q^2$ CO4 -App (8)

(ii) Form a P.D.E by eliminating arbitrary functions from CO4 -App (8)
$z = f\left(\dfrac{xy}{z}\right)$

20. (a) A bar of 10cm long with insulated sides has its ends A and B kept CO5- App (16)
at 20° c and 40^oc respectively. Until steady state condition
prevails. The temperature at A is then suddenly raised to 50^oc and
at the same instant B is lower to 10^oc and maintained thereafter.
Find the subsequent temperature distribution in the bar.

Or

(b) A String is stretched and fastened to two points l apart. Motion is CO5- App (16)
started by displacing the string into the form y=K(lx-x^2) from
which it is released at t=0.Find the displacement of any point at a
distance 'x' at any time 't'

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