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Reg. No. :

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B.E./B.Tech. DEGREE EXAMINATION, MAY 2022

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. 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. 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 (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) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{5}{3}$ (d) $\frac{2}{5}$

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

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

PART – B (5 x 2= 10Marks)

11. Define Chi-square test of goodness of fit.   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

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

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

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

PART – C (5 x 16= 80Marks)

16. (a) (i) The following data are collected on two characters.   CO1-Ana   (8)

	Smokers	Non Smokers
Literates	83	57
Illiterates	45	68

Using chi-square test to find is there any relation between smoking and literacy.

(ii) A company keeps records of accident during a recent safety   CO1-Ana   (8) review , a random sample of 60 accidents was selected and classified by the day of week on which they accured

Days	Mon	Tue	Wed	Thu	Fri
No.of accidents	8	12	9	14	17

Test whether there is any evidence that accidents are more likely on some days than others.

Or

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(b) (i) The 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.   CO1 -Ana   (8)

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 that the die is biased   CO1 -Ana   (8)

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 per day turned out by 5 different workers using 4 different types of machines. Analyse the data   CO2 -Ana   (16)

		Machine Type			
		A	B	C	D
	1	44	38	47	36
Workers	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) State and prove memoryless property of exponential CO3- App (8)
distribution.

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

Or

(b) (i) If $f(x) = kx^2 e^{-x}$, $0 < x < \infty$ find the value of K and find CO3- App (8)
mean and Variance of the distribution.

(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 $(D^2 - 5DD' + 6D'^2)z = e^{x+y}$ CO4-App (8)

(ii) Solve $x(y-z)p + y(z-x)q = z(x-y)$ 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 30cm long with insulated sides has its ends A and B kept CO5- App (16)
at 20° c and 80^oc respectively. Until steady state condition
prevails. The temperature at A is then suddenly raised to 60^oc and
at the same instant B is lower to 40^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'