A Reg. No. : | | | | | | | | | | |

Question Paper Code: 54023

B.E./B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Mechanical Engineering

15UMA423 - STATISTICS AND NUMERICAL METHODS

(Regulation 2015)

(Statistical tables may be permitted)

Duration: Three hours Maximum: 100 Marks

PART A - (10 x 1 = 10 Marks)

1. Sample size for Large sample CO1-U

   (a) <30 (b) = 30 (c) ≥ 30 (d) none

2. The distribution of χ^2 depends on the CO1- E

   (a) observed frequencies (b) degrees of freedom

   (c) expected frequencies (d) none of these

3. Mean square between column mean = CO2- E

   (a) $SSE/c-1$ (b) $SSE/n-c$ (c) $SSC/r-1$ (d) $SSC/c-1$

4. Latin square design is a _____ CO2- U

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

5. What is the order of convergence of Newton-Raphson method if the multiplicity of the root is one? CO3- E

   (a) 2 (b) 1 (c) 0 (d) None of the above

6. The order of convergence in Newton-Raphson method is CO3- E

   (a) atleast 1 (b) 2 (c) 3 (d) 4

7. Newton forward interpolation formula is used only for _____ used. CO4- R

(a) unequal intervals (b) equal intervals (c) both (d) none

8. Find the second divided difference table value for the following data: CO4- R

X	2	5	10
Y	5	29	109

(a) 2.5 (b) 3.5 (c) 1 (d) 0

9. Simpson's 1/3rd Rule is used only when the number of sub intervals is CO5- R ____

(a) odd (b) even (c) any number (d) multiple of 3

10. Trapezoidal Rule is used only when the number of sub intervals is CO5- R

(a) any number (b) even (c) odd (d) multiple of 3

PART – B (5 x 2= 10Marks)

11. Define large sample and small sample. CO1-R

12. Write the ANOVA table for Latin square design. CO2- Ana

13. Find an iterative formula to find $\frac{1}{N}$where N is a real number. CO3- App

14. State Newton's forward difference formula by using operator method. CO4- R

15. State Simpson's one-third rule. CO5- R

PART – C (5 x 16= 80Marks)

16. (a) (i) The sales manager of a large company conducted a sample survey in states A and B taking 400 samples in each case. The results were in the following table. Test whether the average sales in the same in the 2 states at 1% level CO1- E (8)

Average Sales	State A	State B
Mean	Rs. 2500	Rs. 2200
S.D	Rs. 400	Rs. 550

(ii) A group of 10 rats fed on diet A and another group of 8 rats fed on diet B, recorded the following increase in weight(gms) CO1- E (8)

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

Does it show superiority of Diet A over Diet B.

Or

(b) A certain injection administered to each of 12 patients resulted in the following increase of blood pressure: 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the injection will be in general accompanied by an increase in B.P.? CO1- E (16)

17. (a) Three samples each of size 5, were drawn from three uncorrelated normal populations with equal variances. Test the hypothesis that the population means are equal at 5% level. CO2- App (16)

A	10	12	9	6	13
B	9	7	12	11	11
C	14	11	15	14	16

Or

(b) The table given below shows the yield of a certain crop in kgs per plot. The letters A, B, C, D refer to 4 different manorial treatments. Carry out an analysis of variance. CO2- App (16)

A260	B300	C335	D371
B280	A300	D300	C410
D320	C345	B340	A254
C372	D395	A290	B328

18. (a) (i) Find a root of $x\log_{10} x - 1.2 = 0$ by Newton's method correct to three decimal places. CO3-App (8)

(ii) Using the Gauss-Jordan method solve the following equations $10x + y + z = 12;$ CO3-App (8)

$2x + 10y + z = 13; x + y + 5z = 7.$

Or

(b) (i) Using Gauss – Seidel method, solve the equations CO3-App (8)

$4x + 2y + z = 14x + 5y - z = 10; x + y + 8z = 20.$

(ii)Find the numerically largest eigen value of CO3-App (8)

$A = \begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ and the corresponding eigen vector.

19. (a) (i) From the following table, find $y(1.5)$ and $y'(1)$ using cubic spline — CO4- Ana — (8)

x	1	2	3
y	-8	-1	18

(ii) Find $f'(3)$ and $f''(3)$ for the following data: — CO4- Ana — (8)

x	3	3.2	3.4	3.6	3.8	4
$f(x)$	-14	-10.032	-5.296	-0.256	6.672	14

Or

(b) (i) Using Newton's divided difference formula find f(x) and f(6) from the following date: — CO4- App — (8)

x	1	2	7	8
$f(x)$	1	5	5	4

(ii) Fit the cubic spline for the data — CO4- App — (8)
Hence evaluate y(1.5) given that $y_0'' = y_2'' = 0$.

X	1	2	3
Y	-6	-1	16

20. (a) (i) Find the gradient of the road at the middle point of the elevation above a datum line of seven points of road which are given below. — CO5- E — (8)

x	0	300	600	900	1200	1500	1800
y	135	149	157	183	201	205	193

(ii) Evaluate — CO5- E — (8)
$\int_0^1 \frac{1}{1+x^2}$ dx , using Trapezoidal rule with h=0.2. Hence determine the value of π .

Or

(b) (i) Evaluate $\int_1^{1.2} \int_1^{1.4} \frac{1}{x+y} dxdy$ by trapezoidal and simpson's rule — CO5- E — (8)

(ii) Apply Gauss three point formula to evaluate — CO5- E — (8)
$\int_1^2 \frac{1}{1+x^3}$ dx .