A

Question Paper Code: 54023

B.E./B.Tech. DEGREE EXAMINATION, MAY 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. Choose the variable t-distribution range from   CO1-U

    (a) $-\infty \ to \ \infty$ (b) $0 \ to \ \infty$ (c) $0 \ to \ 1$ (d) None of the above

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 are most widely used in the field of _____   CO2- U

    (a) agriculture   (b) industry   (c) medicine   (d) zoology

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

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

6. The power method will work satisfactorily only if A has an _____ Eigen value 　　　　　　　　CO3- E

(a) dominant   (b) smallest

(c) eigen vector   (d) characteristic quation

7. Newton's forward interpolation formula used only for ____intervals 　　　　CO4- R

(a) constant   (b) variable   (c) equal   (d) unequal

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 3/8rd 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 Student's test for difference of means of two samples. 　　　　　CO1-R

12. Explain the meaning and use of analysis of variance. 　　　　　　　　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   CO1- E   (8)
         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

54023

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) (i)1000 students at college level were graded according to their I.Q and their economic conditions. What conclusion can you draw from the following data;   CO1- E   (8)

Economic conditions	I.Q. Level	
	High	Low
Rich	460	140
Poor	240	160

(ii) The following data gives the number of aircraft accidents that occurred during the various days of a week. Find whether the accidents are uniformly distributed over the week.   CO1- E   (8)

Days:	Sun	Mon	Tue	Wed	Thu	Fri	Sat
No. of. accidents:	14	16	8	12	11	9	14

17. (a) A variable trial was conducted on what with 4 varieties in a Latin Square Design. The plan of the experiment and the per plot yield are given below: CO2- App   (16)

C	25	B	23	A	20	D	20
A	19	D	19	C	21	B	18
B	19	A	14	D	17	C	20
D	17	C	20	B	21	A	15

Or

3

54023

(b) A set of data involving four "four tropical feed stuffs A,B,C,D" tried on 20 chicks is given below. All the twenty chicks are treated alike in all respects excepts the feeding treatments and each feeding treatment is given to 5 chicks. Analyze the data. Weight gain of baby chicks fed on different feeding materials composed of tropical feed stuffs. CO2- App (16)

						Total T_i
A	55	49	42	21	52	219
B	61	112	30	89	63	355
C	42	97	81	95	92	407
D	169	137	169	85	154	714
					Grand total	G=1695

18. (a) (i) Using Newton's iterative formula for finding $\sqrt{N}$ where N is a positive real number. Hence evaluate $\sqrt{142}$. 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 $4x + 2y + z = 14x + 5y - z = 10; x + y + 8z = 20.$ CO3-App (8)

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

$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$ and the Corresponding eigen vector.

19. (a) (i) Using Lagrange interpolation formula find f(10) given that CO4- Ana (8)

f(5)=12, f(6)=13, f(9)=14, f(11)=16.

54023

(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) CO4- App (8)
from the following date:

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) Evaluate CO5- E (8)

$I = \int_0^{\frac{1}{2}} \frac{x}{\sin x} \, dx$ correct to 3 decimal places using Romberg's method

(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) Using Simpson's rule, evaluate CO5- E (8)

$\int_4^{4.4} \int_2^{2.6} \frac{dy\,dx}{xy}$

(ii) Apply Gauss three point formula to evaluate CO5- E (8)

$\int_1^2 \frac{1}{1+x^3} \, dx$.

54023