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Question Paper Code	12754
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B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Fourth Semester

CIVIL ENGINEERING

(Common To Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrument and Control Engineering, Mechanical Engineering & Mechanical and Automation Engineering)

20BSMA403 - STATISTICS AND NUMERICAL METHODS

Regulations - 2020

(Use of Statistical Tables is permitted)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

	Marks	K- Level	CO
1. Define Type I and Type II error.	2	K1	CO1
2. Write any two applications of χ^2 test .	2	K2	CO1
3. Write the difference between RBD and LSD.	2	K2	CO2
4. Write the basic assumptions in analysis of variance.	2	K1	CO2
5. What is the order and condition for convergence of Newton-Raphson method?	2	K1	CO3
6. What type of Eigen value can be obtained by using power method?	2	K1	CO3
7. What is the order of error in Trapezoidal rule Simpson's 1/3 rule.	2	K1	CO4
8. State Simpson's rule for evaluating $\int_a^b \int_c^d f(x,y) dx dy$	2	K1	CO4
9. Find y (0.1) by Euler's method, given that $\frac{dy}{dx} = 1 - y$ y (0) = 0.	2	K2	CO5
10. State Milne's Predictor corrector formula.	2	K1	CO5

PART - B (5 × 16 = 80 Marks)

Answer ALL Questions

11. a) i) A simple sample of heights of 6,400 Englishmen has a mean of 170cm and a SD of 6.4cm, while a simple sample of heights of 1600 Americans has a mean of 172cm and a SD of 6.3cm. Do the data indicate that Americans are, on the average, taller than Englishmen?	8	K3	CO1
ii) Two researchers adopted different sampling techniques on a group of students to find the number of students falling into different intelligence level. While investigating the same, Would you say that the sampling techniques adopted by the two researchers are significantly different? The results are:	8	K3	CO1

Researchers	Students		
	Below Average	Average	Above Average
X	86	60	44
Y	40	33	25

OR

b) i) A random sample of 10 boys had the following I.Q's: 70, 120, 110, 101, 88, 83, 95, 98, 107 and 100. Do these data support the assumption of a population mean I.Q of 100? 8 K3 CO1

ii) Before an increase in exercise duty on tea, 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increase in duty, 800 people were tea drinkers in a sample of 1200 people. State whether there is a significant decrease in the consumption of tea after the increase in exercise duty. 8 K3 CO1

12. a) The following table gives monthly sales (in thousand rupees) of a certain firm in the three states by its four salesmen. 16 K3 CO2

States	Salesmen			
	I	II	III	IV
A	6	5	3	8
B	8	9	6	5
C	10	7	8	7

Set up the analysis of variance table and test whether there is any significant difference i) between sales by the firm salesmen, ii) between sales in three states.

OR

b) In a Latin Square experiment given below are the yields in quintals per acre on the paddy crop carried out for testing the effect of five fertilizers A, B, C, D, E. Analyse the data for variations. 16 K3 CO2

B25	A18	E27	D30	C27
A19	D31	C29	E26	B23
C28	B22	D33	A18	E27
E28	C26	A20	B25	D33
D32	E25	B23	C28	A20

13. a) i) Find the real positive root by Newton's method $3x - \cos x = 1$. (Correct to 4 decimal places). 8 K3 CO3

ii) Solve by Gauss-Seidel method the equations: $10x - 5y - 2z = 3$, $4x - 10y + 3z = -3$, $x + 6y + 10z = -3$. 8 K3 CO3

OR

b) i) Solve the following equation by Gauss Elimination method. 8 K3 CO3
 $x + 2y + z = 3$, $2x + 3y + 3z = 10$; $3x - y + 2z = 13$.

- ii) Determine by Power method the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ 8 K3 CO3

14. a) i) Interpolate $y(12)$ if 8 K3 CO4

$x:$	10	15	20	25	30	35
$y(x):$	35	33	29	27	22	14

- ii) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by Trapezoidal rule, Simpson's $\frac{1}{3}$ rule and compare the result with its actual value. 8 K3 CO4

OR

- b) i) Use Lagrange's interpolation formula to find $f(10)$ from the following data: 8 K3 CO4

x	5	6	9	11
$f(x)$	12	13	14	16

- ii) Evaluate $\int_0^1 \int_0^1 \frac{dx dy}{1+x+y}$ by using Trapezoidal rule with $h = 0.25$, $k = 0.5$. 8 K3 CO4

15. a) i) Given $y' = x + y^2$, $y(0) = 1$ find $y(0.1)$ by R-K method. 8 K3 CO5

- ii) Given $5xy' + y^2 = 2$, $y(4) = 1$, $y(4.1) = 1.0049$, $y(4.2) = 1.0097$, $y(4.3) = 1.0143$. Determine $y(4.4)$ by Milne's predictor and corrector method. 8 K3 CO5

OR

- b) Solve $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh with sides $x = 0$, $y = 0$, $x = 3$, $y = 3$ with $u = 0$ on the boundary and mesh length of 1 unit. 16 K3 CO5