

Reg. No.

Question Paper Code

14261

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Fourth Semester

Electrical and Electronics Engineering

(Common to Mechanical Engineering)

20BSMA403 - STATISTICS AND NUMERICAL METHODS

Regulations - 2020

(Use of Statistical Tables is permitted)

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	Marks	K-Level	CO
1. Goodness of fit of a distribution is tested by (a) t-test (b) chi-square test (c) F-test (d) None of the above	1	K1	CO1
2. A statement about a population developed for the purpose of testing is called (a) hypothesis (b) hypothesis testing (c) level of significance (d) test statistic	1	K1	CO1
3. In Latin square design the number of rows, columns and treatments are (a) always different (b) not necessarily equal (c) always equal (d) None of them	1	K1	CO2
4. Which of the following assumption is used in ANOVA? (a) samples must be independent (b) population variances must be equal (c) population must be normally distribute (d) all of them	1	K1	CO2
5. What is the order of convergence of fixed point iteration method? (a) 1 (b) 2 (c) 3 (d) 4	1	K1	CO3
6. The Jacobi's method is a method of solving a matrix equation on a matrix that has no zeroes along _____ (a) Leading diagonal (b) Last column (c) Last row (d) Non-leading diagonal	1	K1	CO3
7. Which of the following interpolation methods can be used for both equally and unequally spaced data points? (a) Newton's Forward Interpolation (b) Newton's Backward Interpolation (c) Lagrange Interpolation (d) Gauss's Forward Interpolation	1	K1	CO4
8. In Simpson's 1/3 rd rule, the number of subintervals n must be (a) Even (b) Odd (c) A power of 2 (d) Any natural number	1	K1	CO4
9. How many prior values are required to predict the next value in Milne's methods? (a) 4 (b) 3 (c) 2 (d) 1	1	K1	CO5
10. $u_{xx} + u_{yy} = 0$ is called (a) Elliptic (b) Parabolic (c) Hyperbolic (d) One dimensional wave equation	1	K2	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. Define type I and type II errors.	2	K1	CO1
12. What are the applications of chi-square distribution?	2	K1	CO1
13. Define Large and small samples.	2	K1	CO1
14. What are the basic principles of design of experiments?	2	K1	CO2
15. Is a 2x2 Latin square design is possible? Why?	2	K1	CO2
16. State any two advantages of a CRD.	2	K1	CO2
17. What is the criterion for the convergence in Newton-Raphson method?	2	K1	CO3

18. For a solving a linear system, compare Gauss elimination method and Gauss seidal method. 2 K1 CO3
19. Obtain the divided difference table for the following data. 2 K2 CO4
- x : -1 0 2 3
- $f(x)$: -8 3 1 12
20. Write the formulae for the first and second order derivatives at the end values $x = x_n$ upto the second order difference term. 2 K1 CO4
21. Which is better Taylor's method or Runge - Kutta Method? 2 K1 CO5
22. Classify the partial differential equation, $x u_{xx} + y u_{yy} = 0$. 2 K2 CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) A sample of heights of 6400 Englishmen has a mean of 67.85 inches and a S.D of 2.56 inches, while a sample of heights of 1600 Australians has a mean of 68.55 and a S.D of 2.52 inches. Do the data indicate that Australians are on the average taller than Englishmen? 11 K3 CO1

OR

- b) A sample analysis of examination results of 1000 students were made and it was found that 260 failed, 110 first class, 420 second class and rest obtained third class. Do these data support the general examination result in the ratio 2:1:4:3? 11 K3 CO1

24. a) Given 11 K3 CO2

Detergent	1	2	3
A	45	43	51
B	47	46	52
C	48	50	55
D	42	37	49

Perform ANOVA and test at 0.05 level of significance whether these are differences in the detergents or in the engines.

OR

- b) The following is a Latin square of a design when 4 varieties of seeds are being tested. Set up the analysis of variance table and state your conclusion. You can carry out suitable change of origin and scale 11 K3 CO2

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

25. a) Find by Newton Raphson method, a positive root of the equation $3x - \cos x - 1 = 0$ correct to 6 decimal places. 11 K3 CO3

OR

- b) Find the numerically largest Eigen value of $A = \begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix}$ and the corresponding Eigen vector by power method. Starting vector is $(1,1,1)^T$. 11 K3 CO3

26. a) Given that

11 K3 CO4

X	1.1	1.2	1.3	1.4	1.5
Y	8.403	8.781	9.129	9.451	9.75

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x=1.1$

OR

b) Evaluate $\int_2^4 \int_4^{4.4} xy \, dx \, dy$ by using Simpson's rule and Trapezoidal rule by taking $h=k=0.1$

11 K3 CO4

27. a) Solve the equation $u_t = u_{xx}$ subject to the conditions $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$, $u(0, t) = u(1, t) = 0$ using Crank Nicolson method $h = 1/3$, $k = 1/36$ one time steps.

11 K3 CO5

OR

b) Solve the Poisson equation

11 K3 CO5

$$u_{xx} + u_{yy} = -81xy, \quad 0 < x < 1; \quad 0 < y < 1 \quad u(0, y) = 0, \quad u(1, y) = 100, \quad u(x, 0) = 0, \quad u(x, 1) = 100 \text{ and } h = \frac{1}{3}$$

28. a) (i) Using Lagrange's interpolation formula, find $y(10)$ from the following table

6 K3 CO4

X	5	6	9	11
Y	12	13	14	16

(ii) Given $\frac{dy}{dx} = y - x^2$, $y(0)=1$, $y(0.2)=1.1218$, $y(0.4)=1.4682$ and $y(0.6)=1.7379$, Evaluate $y(0.8)$ by Adams-Bashforth method.

5 K3 CO5

OR

b) (i) Find $y(12)$ using Newton's forward difference formula given:

6 K3 CO4

X	10	20	30	40	50
Y	46	66	81	93	101

(ii) Using modified Euler's method solve given that $y' = y - x^2 + 1$, $y(0) = 0.5$ find $y(0.2)$.

5 K3 CO5