

23/01/23

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Question Paper Code	11667
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B.E./B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022
Fourth Semester
Mechanical Engineering
(Common to Electrical and Electronics Engineering)
20BSMA403 - STATISTICAL AND NUMERICAL METHODS
(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)
Answer ALL Questions

- | | <i>Marks,</i>
<i>K-Level, CO</i> |
|---|-------------------------------------|
| 1. Write down the formula for t-test for the significance of difference of two means? | 2,K1,CO1 |
| 2. A standard sample of 200 tins of coconut oil gave an average weight of 4.95kgs with a standard deviation of 0.21 kg. Do we accept that the net weight is 5 kgs per tins at 5% level of significance? | 2,K2,CO1 |
| 3. What are the basic principles in the design of experiment? | 2,K1,CO2 |
| 4. What are the uses of ANOVA? | 2,K1,CO2 |
| 5. Solve: $2x + y = 3, x - 2y = -1$ by using Gauss elimination method. | 2,K2,CO2 |
| 6. What is the criterion for the convergence in Fixed point iteration method? | 2,K1,CO3 |
| 7. Find the third divided differences of $f(x) = x^2 + x + 2$ for the arguments 1,3,6,11. | 2,K1,CO4 |
| 8. Write Newton's backward difference formula to find the derivative $\frac{dy}{dx}$ at $x = x_n$. | 2,K1,CO4 |
| 9. Find $y(0.01)$ by using Euler's method, given that $\frac{dy}{dx} = -y, y(0) = 1$. | 2,K1,CO5 |
| 10. Write down the modified Euler formulae for $y' = f(x, y)$. | 2,K1,CO5 |

PART - B (5 × 13 = 65 Marks)
Answer ALL Questions

11. a) (i) A mathematics test was given to 50 girls and 75 boys. The girls made an average grade of 76 with a SD of 6, while boys made an average grade of 82 with a SD of 2. Test whether there is any significant difference between the performance of boys and girls. 8,K2,CO1
- (ii) A dice is thrown 400 times and a throw of 3 or 4 is observed 150 times. Test the hypothesis that the dice is fair. 8,K3,CO1

OR

- b) (i) Two horses A and B were tested according to the time to run a particular race with following results: 8,K2,CO1

Horse A:	28	30	32	33	33	29	34
Horse B:	29	30	30	24	27	29	-

Test whether the horse A is running faster than B at 5% level of significance.

- (ii) The demand for a particular spare part in a factory was found to vary from day-to-day. In a sample study the following information was obtained: 8,K2,CO1

Days	Mon	Tues	Wed	Thurs	Fri	Sat
No. of spares	1124	1125	1110	1120	1126	1115

Test the hypothesis that the number of parts demanded does not depend on the day of the week.

12. a) The following are the number of mistakes made in 5 successive days by 4 technicians working for a photographic laboratory test at a level of significance $\alpha = 0.01$. Test whether the difference among the four samples means can be attributed to chance. 16,K2,CO2

Technician			
I	II	III	IV
6	14	10	9
14	9	12	12
10	12	7	8
8	1	15	10
11	14	11	11

OR

- b) A farmer wishes to test the effect of 4 fertilizers A, B, C, D on the yield of wheat. The fertilizers are used in a LSD and the result are tabulated here. Perform an analysis of variance. 16,K2,CO2

A18	C21	D25	B11
D22	B12	A15	C19
B15	A20	C23	D24
C22	D21	B10	A17

13. a) (i) Solve $5x - y + z = 10$, $2x + 4y = 12$; and $x + y + 5z = -1$ by Gauss Seidel Method. 8,K3,CO3

- (ii) Solve using Newton Raphson method for $3x - \cos x = 1$ upto 4 decimal places. 8,K3,CO3

OR

- b) (i) Using Gauss Jordan method solve $10x + y + z = 12$, $2x + 10y + z = 13$, $x + y + 5z = 7$. 8,K3,CO3

- (ii) Find the numerically largest eigen value and vector matrix 8,K3,CO3

$$A = \begin{pmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{pmatrix} \text{ using power method.}$$

14. a) (i) The population of a town is as follows:

8,K3,CO4

X: Year	1941	1951	1961	1971	1981	1991
Y: Population in thousands	20	24	29	36	46	51

Estimate the population increase during the period 1946 to 1976.

- (ii) Using Lagrange's Interpolation Formula, fit a polynomial to the following data: 8,K2,CO4

x	-1	0	2	3
y	-8	3	1	12

And hence find y at $x = 1.5$.

OR

- b) (i) The velocity of a train which starts from rest is given by the following table, time being reckoned in minutes from the start and speed in miles per hour. 8,K3,CO4

minutes	2	4	6	8	10	12	14	16	18	20
miles/hr	10	18	25	29	32	20	11	5	2	0

Find the distance covered in 20 minutes.

- (ii) Evaluate $\int_0^5 \frac{dx}{5+4x}$ using Trapezoidal Rule & Simpson's 1/3rd Rule 8,K3,CO4

with $h = 0.5$ and hence find the value of $\log_e 5$.

15. a) Solve $\frac{dy}{dx} = 1 - y$, $y(0) = 0$, Find the following by using 16,K2,CO5

- Euler's Method for $y(0.1)$
- Modified Euler's method for $y(0.2)$
- Modified Euler's method for $y(0.3)$
- Milne's Predictor-Corrector Formula for $y(0.4)$.

OR

- b) Using Runge-Kutta Method of 4th order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given 16,K2,CO5
 $y(0) = 1$ at $x = 0.2, 0.4$ Take $h = 0.2$.