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Question Paper Code: 44023

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

Fourth Semester

Mechanical Engineering

14UMA423 - STATISTICS AND NUMERICAL METHODS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

(Statistical Tables are permitted)

PART A - (10 x 1 = 10 Marks)

- The null and alternative hypotheses divide all possibilities into
 - two sets that overlap
 - two non-overlapping sets
 - two sets that may or may not overlap
 - as many sets as necessary to cover all possibilities
- The chi-square goodness-of-fit test can be used to test for
 - significance of sample statistics
 - difference between population means
 - normality
 - probability
- Mean square between the samples is given by
 - $SSE/c-1$
 - $SSE/n-c$
 - $SSC/c-1$
 - $SSC/n-c$
- What is main advantage of Latin square design over Randomized Block Design
 - Controls the effect of one extraneous variables
 - Controls the effect of two extraneous variables
 - No control over the variables
 - Limited Control over the variables
- 2x2 Latin square is not possible. Why?
 - Comparison is not possible
 - One Comparison is not possible
 - Mean Squared Error possible
 - Sum of Square is possible

6. The order of Convergence of Newton-Raphson's method is
 (a) 1 (b) 0 (c) 2 (d) 3
7. _____ formula is used to find the unknown values of 'y' for some x which lies at the end of the tabular values
 (a) Newton's Forward (b) Lagrange's
 (c) Newton's divided difference (d) Newton's Backward
8. For what type of data the divide and different table is used
 (a) Equal interval (b) Unequal interval
 (c) Marginal interval (d) All type of interval
9. Newton's forward interpolation formula used only for _____ intervals.
 (a) Un equal intervals (b) In-Equidistance intervals
 (c) Equidistance intervals (d) Anisometric Intervals
10. The Gaussian quadrature formula is also knows as
 (a) Forward form (b) Divided different form
 (c) Three point form (d) Backward form

PART - B (5 x 2 = 10 Marks)

11. What is a null hypothesis?
12. Write the differences between RBD and LSD.
13. Solve the following system of equations, using Gauss - Jordan elimination method
 $2x + y = 3, x - 2y = -1.$
14. What is the assumption we make when Lagrange's formula is used?
15. Write the Gaussian three points Quadrature formula

PART - C (5 x 16 = 80 Marks)

16. (a) A real estate agency wants to compare the appraised values of single-family homes in two cities in Michigan. A sample of 60 listings in Lansing and 99 listings in Grand Rapids yields the following results (in thousands of dollars):

	Lansing	Big Rapids
\bar{X}	191.33	172.34
S	32.60	16.92
n	60	99

Is there evidence of a significant difference in the average appraised values for single-family homes in the two Michigan cities? Use 0.05 level of significance. (16)

Or

- (b) Before an increase in excise 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. Using standard error of proportion, state whether there is a significant decrease in the consumption of tea after the increase in excise duty? (Z_α at 5% level 1.645, 1% level 2.33). (16)

17. (a) Five doctors, each test five treatments for a certain disease and observe the number of days each patient takes to recover. The results are as follows:
Given Recovery time in days.

Doctors	Treatments				
	1	2	3	4	5
A	10	14	23	19	20
B	11	15	24	17	21
C	9	12	20	16	19
D	8	13	17	17	20
E	12	15	19	15	22

Discuss the significant difference between (i) doctors (ii) treatments. (16)

Or

- (b) Compare and contrast the Latin square design with the Randomised Block Design. (16)
18. (a) (i) Using Newton - Raphson method, solve $x \log_{10} x = 12.34$ taking the initial value x_0 as 10. (8)
- (ii) Solve by Gauss - elimination method the following system
 $3x + 4y + 5z = 18$; $2x - y + 8z = 13$; $5x - 2y + 7z = 20$. (8)

Or

- (b) (i) Solve the system of equations by Gauss-Jordan method $x + 2y + z = 3$,
 $2x + 3y + 3z = 10$, $3x - y + 2z = 13$. (8)
- (ii) Solve the following system of equations by Gauss-Seidel method
 $10x - 5y - 2z = 3$, $4x - 10y + 3z = -3$, $x + 6y + 10z = -3$. (8)
19. (a) Using Newton's forward interpolation formula, find the polynomial $f(x)$ satisfying the following data. Hence evaluate $f(x)$ at $x = 5$. (16)

x	:	4	6	8	10
$f(x)$:	1	3	8	10

Or

(b) Using Newton's divided difference , find $f(2)$, $f(8)$ and $f(15)$ from the following data:

X	:	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

(16)

20. (a) (i) By dividing the range into 10 equal parts, evaluate $\int_0^{\pi} \sin x \, dx$ by Trapezoidal rule. (8)

(ii) Evaluate $\int_{-1}^1 \frac{x^2}{1+x^4} dx$ by using three points Gauss quadrature formula. (8)

Or

(b) The population of a certain town is given below. Find the rate of growth of the population in 1931, 1941, 1961 and 1971.

<i>Year x</i>	:	1931	1941	1951	1961	1971
<i>Population y</i>	:	40.62	60.80	79.95	103.56	132.65

(16)
