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B.Tech.(ME) (2012 Onwards) (Sem.–6)

STATISTICAL AND NUMERICAL METHODS IN ENGINEERING

Subject Code : BTME-604

M.Code : 71188

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) An incomplete frequency distribution is given below :

Variable	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	12	30	f_1	65	f_2	25	18

Given that the total frequency is 229 and median is 46. Find the missing frequencies f_1, f_2.

b) The probability that a pen manufactured by a company will be defective is 0.1. If 12 such pens are manufactured, find the probability that at least two will be defective.

c) Explain different types of errors.

d) Discuss intermediate value property.

e) Prove that if λ is an eigen value of an orthogonal matrix A, then 1/λ is also its eigen value.

f) Write Newton's-backward interpolation formula.

g) Explain sampling distributions of the means.

h) Discuss predictor-corrector method.

i) Write Euler-Mechlaurin's formula.

j) Discuss ill-conditioned equations.

SECTION-B

2. One thousand articles from a factory are examined and found to be three percent defective. Fifteen hundred similar articles from a second factory are found to be only two percent defective. Can it reasonably be concluded that the product of the first factory is inferior to the second.

3. Use the Newton-Raphson procedure for finding $\sqrt[3]{N}$ where N is a real number. Use it to find $\sqrt[3]{18}$ correct to two decimal places, assuming 2.5 as the initial approximation.

4. Find an approximate value of $\int_0^1 \frac{dx}{1+x^2}$ by using :

   a) Trapezoidal rule,

   b) Simpson's 1/3 rule

   c) Simpson's 3/8 rule.

5. Determine the number of terms required in the series for log $(1 + x)$ to evaluate log (1.2) correct to six decimal places.

6. Find the first and second order derivatives of the function $f(x)$ at the point x =1.5, if

x	1.5	2.0	2.5	3.0	3.5	4.0
$f(x)$	3.375	7.000	13.625	24.000	38.875	59.000

SECTION-C

7. Determine the largest eigen value and the corresponding eigen-vector of the matrix

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

8. Using modified Euler's method and Runge-Kutta method of order 4, find $y(0.2)$ for $\frac{dy}{dx} = x + y^2$ with $y(0) = 1$. (Take $h = 0.1$)

9. In an intelligence test administered to 1,000 students, the average score was 42 and the standard deviation was 24. Find :

   a) The number of students exceeding a score of 50.

   b) The number of students lying between 30 and 54.

   c) The value of the score exceeded by the top 100 students.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.