

Roll No.

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (ME) (Sem.-6)

**STATISTICAL AND NUMERICAL METHODS IN ENGINEERING**

Subject Code : BTME-604

M.Code : 71188

Date of Examination : 09-07-22

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) Define mean, median, mode and standard deviation.
- b) What do you mean by mutually exclusive events in Probability Theory? Also give an example of mutually exclusive events.
- c) What do you mean by sampling distribution.
- d) Discuss the concept of Relative Error in numerical computing by considering an example.
- e) Write the formula of Newton-Raphson method. When does it fail to perform?
- f) Evaluate  $\Delta(x^2 + \sin x)$ , where  $\Delta$  denotes the forward difference operator.
- g) Discuss the concept of Interpolation by considering an example.
- h) Write the formula of Simpson's 1/3-rule of numerical integration.
- i) State eigen value problem.
- j) What are the disadvantages of Taylor series method for solving first order initial value problems of ordinary differential equations?

**SECTION-B**

2. Find the missing frequency for the following distribution whose mean is 50 :

$x$	10	30	50	70	90
$f$	17	?	32	24	19

3. Define Poisson distribution. Also fit a Poisson distribution to the following data :

$x$	0	1	2	3	4
$f$	122	60	15	2	1

4. a) Find the positive root of  $x^3 = 2x + 5$  using method of false position.  
 b) Find the smallest positive root of  $x^2 - 5x + 1 = 0$  using bisection method.
5. A sample of 20 items has mean 42 units and standard deviation 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units.
6. Find the number of terms of the exponential series such that their sum gives the value of  $e^x$  correct to six decimal places at  $x = 1$ .

### SECTION-C

7. a) Find the cubic polynomial which takes the following values :

$x$	0	1	2	3
$f(x)$	1	2	1	10

Hence evaluate  $f(4)$  and  $f(5)$ .

- b) i) What do you mean by permanence property of interpolating polynomials?  
 ii) Give two uses of interpolating polynomials. Discuss with examples.
8. a) Using Simpson's 1/3-rule, evaluate  $\int_0^1 x e^x dx$  taking four intervals. Compare the results with its actual value. Also write a note on error in Simpson's 1/3-rule.  
 b) Determine the largest eigen value in magnitude and its corresponding eigen vector for the following matrix by using power method  $\begin{bmatrix} 6 & 1 & 0 \\ 1 & 40 & 1 \\ 0 & 1 & 6 \end{bmatrix}$
9. a) Given that  $y' = x^3 + y$ ;  $y(0) = 2$ , compute  $y(0.2)$ ,  $y(0.4)$  using Runge-Kutta method of fourth order.  
 b) Solve  $u_{xx} + u_{yy} = 0$  over the square mesh of side four units satisfying the following boundary conditions  
 $u(0, y) = 0$  for  $0 \leq y \leq 4$ ,  $y(4, y) = 12 + y$  for  $0 \leq y \leq 4$   
 $u(x, 0) = 3x$  for  $0 \leq x \leq 4$ ,  $u(x, 4) = x^2$  for  $0 \leq x \leq 4$ .

**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.**