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## Total No. of Questions : 18

## B.Tech. (Automobile Engineering) (Sem.-5) NUMERICAL METHODS Subject Code : BTAE-502-18 M.Code : 78226

## 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**

#### Write briefly :

- 1. State Simpson's three Eighth rule
- 2. In four tosses of a coin, let x be the number of heads. Calculate the expected value of x.
- 3. A sample of 20 items has a mean 42 units and S.D.5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units.
- 4. Find a real root of the equation  $x = e^{-x}$  using Newton Raphson method.
- 5. Evaluate  $\Delta \tan^{-1} x$
- 6. Find positive real root of  $x^3 x = 1$  by bisection method, correct upto 2 decimal places between and 2.
- 7. State Merit's of Lagrange's formula
- 8. Define Spline function.
- 9. Define types of numerical instability.
- 10. Prove that the absolute error in the common logarithm of a number is less than half the relative error of the given number.

#### **SECTION-B**

- 11. Solve the problem  $y'' xy'^2 + y^2 = 0$ . y(0) = 1, y'(0) = 0 to evaluate y(0.1) using Taylor's series methods.
- 12. Use Gauss elimination method to solve the following system of equations:

2x + y + z = 10, 3x + 2y + 3z = 18, x + 4y + 9z = 16

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13. Fit a poisson distribution to the following data and test the goodness of fit:

x	0	1	2	3	4
f	109	65	22	3	1

- 14. Use Adam's Moulton-Bashforth method to find y (1.4) given  $\frac{dy}{dx} = x^2 (1+y)$ , y (1) = 1, y (1.1) = 1.233, y (1.2) = 1.548 and y (1.3) = 1.979.
- 15. a) Compute f'(3) from the following table:

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x	1	2	4	8	10
$\mathbf{F}(\mathbf{x})$	0	1	5	21	27

b) Given the initial value problem :  $y' = 1 + y^2$ , y(0) = 0, Find y (0.6) by Runge Kutta fourth order method taking h = 0.2

#### **SECTION-C**

16. A river is 80m wide. The depth 'y' of the river at a distance 'x' from one bank is given by following table:

x	0	10	20	30	40	50	60	70	80
y	0	4	7	9	12	15	14	8	3

Find the approximate area of cross-section of the river using Simpson's one – third rule.

17. a) A tank is discharging water through an orifice at a depth of x metre below the surface of the whose area is A  $m^2$ . Following are the values of x for the corresponding values of A.

Α	1.257	1.39	1.52	1.65	1.809	1.962	2.123	2.295	2.462	2.650
x	1.5	1.65	1.8	1.95	2.1	2.25	2.4	2.55	2.7	2.85

Using the formula (0.018) T =  $\int_{1.5}^{3.0} \frac{A}{\sqrt{x}} dx$ , calculate T, the time (in seconds) for the

level of the water to drop from 3.0 m to 1.5 m above the orifice.

b) Using Newton's divided difference formula, calculate the value of f(6) from the following data:

x	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

18. Find a positive value of  $(17)^{\frac{1}{3}}$  correct to four decimal places by Newton's Raphson's method.

# 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.