Roll No. ☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

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:

x	1	2	4	8	10
$F(x)$	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.

A	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.