[April-19]

[EMA 202]
B.Tech. Degree Examination

Civil, CSE. ECE, EEE & MECH
IV SEMESTER

NUMERICAL METHODS

(Effective from the admitted batch 2015–16)

Time: 3 Hours **Max.Marks: 60**

Instructions: Each module carries 12 marks.
Answer all modules choosing one question from each module.
All parts of the module must be answered in one place only.
Figures in the right hand margin indicate marks allotted.

MODULE-I

1. a) Apply Newton Raphson method to determine a root of the equation $Cosx = xe^x$, upto five iterations. 6

   b) Find the root of the equation $x - e^{-x} = 0$ using Secant method, correct to 3 decimal places. 6

OR

2. a) Using Bisection method, find a positive real root of $x^3 - 5x + 1 = 0$, upto to 5 iterations. 6

   b) Use method of False Position to obtain a root of the equation $x^3 - x - 1 = 0$, correct to three decimal places. 6

MODULE-II

3. a) Prove the relations :

   (i) $\delta^2 E = \Delta^2$

   (ii) $\mu E = E\mu$

   (iii) $E^{1/2} = \mu - \delta/2$ 6

   b) Give the table of values for $y = \sqrt{x}$.

x	150	152	154	156
Y	12.247	12.329	12.410	12.490

Evaluate $\sqrt{155}$ using Lagrange's interpolation formula. 6

OR

4. a) Use Newton's divided-difference formula to calculate f(3) from the following table: 6

x	0	1	2	4	5	6
f(x)	1	14	15	5	6	19

b) Given the following set of values, form the difference table and write down the values of $\nabla^3 y_{15}, \nabla y_{25}, \nabla 5 y_{10}$. 6

x	10	15	20	25	30	35
y	19.97	21.51	22.47	23.52	24.65	25.89

MODULE-III

5. a) Solve the system of equations $4x + y + 2z = 4, 3x + 5y + z = 7$ and $x + y + 3z = 3$ by Gauss-Sidel method, correct to three decimal places. 6

b) Solve the following system of equations 10x+2y+z=9, 2x+20y-2z = - 44 and -2x+3y+10z=22 by Jacobi method, correct to two decimal places. 6

OR

6. Find the largest eigen value in modulus and the corresponding eigen vector of the matrix

$$A = \begin{bmatrix} 4 & 1 & 0 \\ 1 & 20 & 1 \\ 0 & 1 & 4 \end{bmatrix}$$

using power method. 12

MODULE-IV

7. From the following table, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x=1.2 12

x	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

OR

8. a) The velocities of a car (running on a straight road) at intervals of 2 minutes is given below

Time in minutes	0	2	4	6	8	10	12
Velocity in km/hr	0	22	30	27	18	7	0

Apply Trapezoidal rule to find the distance covered by the car. 6

b) Evaluate $\int_4^{5.2} \log x dx$ using Simson's 1/3nd and 3/8th rule with h=0.2. 6

MODULE-V

9. a) Using Taylor's series, find y at x=0.1 for $\frac{dy}{dx} = x - y^2, y(0) = 1,$ correct to four decimal places. 6

b) Use RK method to solve $10\frac{dy}{dx} = x^2 + y^2, y(0) = 1,$ for the interval $0 < x \leq 0.4$ with h = 0.1. 6

OR

10. a) Using Picard's method, obtain the solution of $y' = x(1 + x^3y)$, $y(0) = 3$. 6

b) Solve by Euler's method, the equation $\frac{dy}{dx} = x + y, y(0) = 0.$ Choose h=0.2 and y(0.4) and y(0.6). 6