[EMA 202]
B.Tech. Degree Examination

Civil, CSE & Mechanical Engineering
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 unit.
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) Find the real root of the equation $3\sin x - 2x + 5 = 0$ near to 3 decimal places by Newton's Raphson method 6

   b) Find a real root of the equation $x^3 - 2x - 5 = 0$, using secant method 6

OR

2. a) Find a real root of $x^3 - 5x + 3 = 0$ using Bisection method 6

   b) Find the real root of the equation $xe^x - \sin x = 0$, correct to three decimal places by Regula-falsi method 6

MODULE-II

3. a) Prove that $e^x = \left(\frac{\Delta^2}{E}\right) e^x x \frac{Ee^x}{\Delta^2 e^x}$ 6

   b) Apply Lagrange's method to find the value of x when f(x)=15 from the given data 6

x	5	6	9	11
f(x)	12	13	14	16

OR

4. a) The table gives the distances in nautical miles of the visible horizon for the given heights in feet above the earth's surface: 6

x = height	100	150	200	250	300	350	400
y = distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

Find the values of y when x=218 ft

b) Given the set of tabulated points (0,2), (1,3), (2,12) and (15, 3587) satisfying the function y = f(x), compute f(4) using Newton's divided difference formula 6

MODULE-III

5. Solve the system of linear equations $5x+2y+z=12, x+4y+2z=15, x+2y+5z=20$ by Gauss-Sidel iteration method, correct to three decimal places 12

OR

6. Determine the largest eigen value and the corresponding eigen vector of the matrix $\begin{bmatrix} 4 & 1 & 0 \\ 1 & 20 & 1 \\ 0 & 1 & 4 \end{bmatrix}$ to three correct decimal places using the power method 12

MODULE-IV

7. a) For the following data, find $\frac{dy}{dx}$ at $x=5$ 6

x	0	1	2	3	4	5	6
y:	6.9897	7.4036	7.7815	8.1291	8.4510	8.7506	9.0309

b) Evaluate $\int_0^2 e-x^2\,dx,$ by using Trapezoidal rule and Simpson's $\frac{1}{3}$ rule taking h=0.25 6

OR

8. a) Using Bessel's formula, find $f'(7.5)$ from the following table: 6

x	7.47	7.48	7.49	7.50	7.51	7.52	7.53
f(x)	0.193	0.195	0.198	0.201	0.203	0.206	0.208

b) Evaluate $\int_0^{\frac{\pi}{2}} e^{\sin x} dx$ correct to 4 decimal places, by Simson's 3/8 rule 6

MODULE-V

9. a) Solve Numerically $\frac{dy}{dx} = x - y, y(0) = 1$ by modified Euler's method to compute y(0.1) and y(0.2) 6

b) Solve $\frac{dy}{dx} = x + y^2, y(0) = 1$, Find y(0.2) by Runge-Kutta method of order 4 6

OR

10. Using Taylor's series method, find y for x=0.1, 0.2, 0.3 given that $\frac{dy}{dx} = xy + y^2, y(0) = 1$ continue the solution at x=0.4 using Milne's method 12