
JAYA ENGINEERING COLLEGE, THIRUNINRAVUR
4th SEMESTER - B.E
INTERNAL ASSESSMENT -3 (MODEL EXAMINATION -3)

SUBJECT: NUMERICAL METHODS
SUB CODE: MA6459
BRANCH: AERO, CIVIL,EEE,EIE

DURATION: 3 HRS
MAX MARKS: 100
DATE: 10/04/2015

Part A Answer all the Questions (10X2=20)

1 State the order of convergence and the condition for the convergence in Newton's method.

2 Using Gauss elimination method, solve $5x + 4y = 15$, $3x + 7y = 12$.

3 Find the second degree polynomial through the points (0,2) (2,1), (1,0) using Lagrange's formula.

4 For cubic splines, what are the 4n conditions required to evaluate the unknowns.

5 Evaluate $\int_{\frac{1}{2}}^{1} \frac{1}{x} dx$ by Trapezoidal rule, dividing the range into 4 equal parts.

6 State three point Gaussian quadrature formula.

7 Find $y(1.1)$ if $y' = x + y$, $y(1) = 0$ by Taylor series method.

8 Write the Adam – Bashforth predictor and corrector formulae

9 Obtain the finite difference scheme for the differential equation $2y'' + y = 5$

10 Write Liebmann's iteration process.

Part B Answer as per Choice (5X16=80)

11 a) Find a root of $x\log_{10}^{x} - 1.2 = 0$ by Newton Raphson method correct the three decimal placed. (8 marks)

b) Apply Gauss-Seidal method to solve the equations $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$ (8 marks)

Or

c) Find, by Gauss-Jordan method, the inverse of the matrix $\begin{bmatrix} 4 & 1 & 2 \\ 2 & 3 & -1 \\ 1 & -2 & 2 \end{bmatrix}$ (8 marks)

d) Find the numerically largest eigen value of $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ and its corresponding eigenvector by power method, (8 marks)

12 a) Using Lagrange's interpolation, calculate the profit in the year 2000 from the following data:

Year :	1997	1999	2001	2002
Profit Lakhs Rs.	43	65	159	248

(8 marks)

b) From the following table: (8 marks)

x :	1	2	3
y :	- 8	-1	18

Compute y(1.5) and y (1)′ using cubic sphere.

Or

c) By using Newton's divided difference formula find f (8) , given (8 marks)

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

d) Given the following table, find the number of students whose weight is between 60 and 70 lbs: (8 marks)

Weight (in lbs) x :	0 – 40	40 – 60	60 – 80	80 – 100	100 – 120
No. of students :	250	120	100	70	50

Or

13 a) Given the following data, find $y'(6)$ and the maximum value of y (if it exists) (8 marks)

x :	0	2	3	4	7	9
y :	4	26	58	112	466	922

b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Romberg's method correct to 4 decimal places. Hence deduce an approximate value for π (8 marks)

Or

c) Evaluate $\int_1^2 \frac{dx}{1+x^3}$ using 3 point Gaussian formula. (8 marks)

d) Evaluate $\int_1^{1.2}\int_2^{2.4} \frac{1}{xy} dxdy$ using Simpon's one-third rule. (8 marks)

14 a) Using Taylor series method solve $\frac{dy}{dx} = x^2 - y, y(0) = 1$ at . x = 0.1, 0.2, 0.3 Also compare the values with exact solution.

b) Given $5xy' + y^2 = 2, y(4) = 1, y(4.1) = 1.0049, y(4.2) = 1.0097, y(4.3) = 1.0143$ Compute using Milne's method $y(4.4)$ (8 marks)

Or

c) Given $y' = y - x^2, y(0) = 1, y(0.2) = 1.1218, y(0.4) = 1.4682,$ and $y(0.6) = 1.7379$ evaluate $y(0.8)$ by Adam's predictor-corrector method. (8 marks)

d) Use Runge – Kutta method of fourth order to find $y(0.2)$, given $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}, y(0) = 1$ with $h = (0.2)$ (8 marks)

15 a) Solve by Bender-Schmidt formula upto t=5 for the equation $u_{xx} = u_t$ subject to u(0,t)=0 , u(5,y)=0,u(x,0)= $x^2(25 - x^2)$ taking h=1. (8 marks)

b) Solve $4u_{tt} = u_{xx}, u(0,t) = 0, u(4,t) = 0, u(x,0) = x(4-x), u_t(x,o) = 0, h = 1$ upto t=4. (8 marks)

Or

c) By iteration method, solve the elliptic equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ over a square region of side 4; satisfying the boundary conditions $u(0,4) = 0 \quad 0 \le y \le 4, \quad u(4,y) = 12+y \quad 0 \le y \le 4,$

$u(x,0) = 3x \quad 0 \le x \le 4, \quad u(x,y) = x^2 \quad 0 \le x \le 4$

By dividing the square into 16 square meshes of side 1 and always correcting the computed values to two places of decimals, obtain the values of at 9 interior pivotal points. U (16 marks)

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