Reg. No.....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2014

(U.G.—CCSS)

Mathematics

MM 6B 11—NUMERICAL METHODS

Time : Three Hours

Maximum : 30 Weightage

I. Answer all *twelve* questions :-

1 Forward difference Δy = _____

2 1- – _____

(a) V.

(b) δ.

(c)

(d) Δ.

3 Define averaging operator μ.

4 A = _____ = $\delta E^{1/2}$.

(a) ∇E.

(b) AE.

(c)

(d) 6E.

5 Show that $e^x \left| u_0 + x\Delta u_0 + \frac{x^2}{2!} \Delta^2 u_0 + \ldots \right.$

$$1 + xE + \frac{x^2 E^2}{2!}$$

6 Write Sim son's $\frac{3}{8}$-Rule.

7 Define the characteristic polynomial of a square matrix A.

8 The shift operator E is defined as E_{y_r} = _____

9 $\frac{1}{2}$ 2 | _____

Turn over

10 Write Newton's forward difference interpolation formula.

11 $1+\frac{1}{4}\delta^{2} =$ _____

(a) A^2. (b) ∇^2

(c) μ^2 (d) 6^2

12 Write Gauss backward formula.

(12 x ¼ = 3 weightage)

II. Answer all *nine* questions :-

13 Define central difference opertor 8 ?

14 Prove that $e^x \left| u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \right|$

$= U0 + \frac{x^2}{2!} U2 + \ldots..$

15 Write Gauss forward formula.

16 The function $y = \sin x$ is tabulated below :

	0	4
$y = \sin x$	0	0.70711

Using Lagrange's interpolation formula find the value of sin (V.

17 Write the Trapezoidal rule.

18 Define the eigen value of a square matrix.

19 Find the integers between which the real root of $xe^x - 1 = 0$ lies.

20 Given $\frac{dy}{dx} = y -$ where y(0) = 2. Find y (0.1) correct to four decimal places by Runge-Kutta second order formula.

21 Define the spectral radius of a square matrix.

(9 x 1 = 9 weightage)

III. Answer any *five* questions from seven

22 Using Newton's general interpolation formula with divided differences find f (x) as a polynomial in x. Given

x	—1	0	3	6	7
$f(x)$			39	822	1611

23 Using Trapezoidal rule evaluate $I = \int_0^1 \frac{dx}{1+x}$ **correct to three decimal places. Take h = 0.5.**

24 Determine the largest eigen value and the corresponding eigen vector of the matrix

$$A = \begin{matrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{matrix}$$

25 Given the differential equation $\frac{dy}{dx} = \frac{x}{y^2+1}$ **with the initial condition y = 0 when x = 0 . Use Picard's method to obtain y for x = 0.25.**

26 Using Lagrange's interpolation formula, find the form of the function y (x) from the following table

x	0	1	3	4
y	– 12	0	12	24

27 Find the following table find the value of $e^{1.17}$ using Gauss' forward formula.

x	1	1.05	1.10	1.15	1.20	1.25	1.30
e^x	2.7183	2.8577	3.0042	3.1582	3.3201	3.4903	3.6693

28 Use the Newton-Raphson method to find a root of the equation $x^3 - 2x - 5 = 0$.

(5 x 2 = 10 weightage)

Turn over

IV. Answer *two* questions from *three*

29 By using Newton's forward difference interpolation formula find the cubic polynomial whic takes the following values

$$y(1) = 24,\ y(3) = 120,\ y(5) = 336, y(7) = 720.$$

30 Solve the equation $2x + 3y + z = 9$, $x + 2y + 3z = 6$, $3x + y + 2z + 8$ by LV decomposition.

31 Using Modified Euler's method determine the value of y when x = 0.1 given th

(2 x 4 = 8 weightag

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