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SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2013

(CCSS)

Mathematics (Core Course)

MM 6B 11—NUMERICAL METHODS

Time : Three Hours

Maximum : 30 Weightage

I. Answer all *twelve* questions :

1. Forward difference Δy_0 –

2. ∇y_n =

3. E 1 +

   (a) V. (b) 6.

   (c) A. (d) .

4. Write Gauss forward formula.

5. $E^n y_r$

6. A – ∇E

   (a) 6E. (b) $\delta^{1/2}E$

   (c) $\delta^{1/} E^{1/2}$. (d) $\delta E^{1/2}$.

7. Write Simpson's $\frac{1}{3}$ - Rule.

8. Define the spectrum of a square matrix.

9. $E^{1/2}$ E = ______________

   (a) 6. (b)

   (c) A. (d) ∇.

Turn over

10. Define the characteristic equation of a square matrix A.

11. Show that $e^{x}\left(u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \cdots\right)$

$$= e^{xE} u_0$$

12. Define Central difference operator 6.

(12 x ¼ = 3 weightage)

II. Answer all *nine* questions :

13. Define Backward difference operator.

14. Define the shift operator E.

15. Show that $e^{x}\left(u_0 + x\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \cdots\right)$

$$\left(1 + xE + \frac{x^2E^2}{2!} \cdots\right) u_0.$$

16. Certain correspondence values of x and $\log_{10} x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871) using Lagrange's formula find $\log_{10} 301$.

17. Write Simpson's $\frac{3}{8}$-Rule.

18. Define the eigen vector of a square matrix.

19. Define the spectral radius of a square matrix.

20. Find the integers between which the real root of $x^3 - 2x - 5 = 0$ lies.

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

(9 x 1 = 9 weightage)

III. Answer any *five* questions from 7

22. Find a real root of $x^3 - 2x — 5 = 0$ using secant method.

23. The table below gives the values of tan x for 0.10 x 5 0.30.

	: 0.10	0.15	0.20	0.25	0.30
y = tan x	: 0.1003	0.1511	0.2027	0.2553	0.3093

Find tan 0.12 using Newton's forward difference interpolation formula.

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

25. Solve the system 2x + y + *z* =*10*, 3x + 2y + 3z =18, x + 4y + 9z =16 by the Gauss-Jordan method.

26. Tabulate $y = x^3$ for x = 2, 3, 4 and 5 and calculate the cube root of 10 correct to three decimal places.

27. From the Taylor series for y (x) find y(0.1) correct to four decimal places if $y($ x) satisfies

28. Using Simpson's rule evaluate $j = \frac{1}{1+x} dx$ correct to three decimal places. Take $h = 0.5$.

(5 x 2 = 10 weightage)

IV. Answer *two* questions from 3 :

29. Find the Lagrange interpolating polynomial of degree two approximating the function y = lnx defined by the following table of values.

	2	2.5.	3
y = lnx	0.69315	0.91629	1.09861

Turn over

30. Determine the largest eigenvalue and the corresponding eigen vector of the matrix

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

31. Using Modified Eu er's Method determine the value of y when x = 0.1 given th

$y(0) = 1, y' = x^2 + y.$

(2 x 4 = 8 weighta