C 40396 (Pages : 4) Name..............................

Reg. No..............................

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 $\Delta y_0 =$ ————.

2. $\mu y_n =$ ————.

3. $E \equiv 1 +$ ————.

   (a) ∇. (b) δ.

   (c) Δ. (d) μ.

4. Write Gauss forward formula.

5. $E^n y_r =$ ————.

6. $\Delta = \nabla E =$ ————.

   (a) δE. (b) $\delta^{1/2} E$.

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

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

8. Define the spectrum of a square matrix.

9. $E^{1/2} - E^{-1/2} =$ ————.

   (a) δ. (b) μ.

   (c) Δ. (d) ∇.

Turn over

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

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

$$= e^{xE} u_0$$

12. Define Central difference operator δ.

(12 × ¼ = 3 w

II. Answer all *nine* questions :

13. Define Backward difference operator.

14. Define the shift operator E.

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

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

16. Certain correspondence values of x and $\log_{10} x$ are $(300, 2.4771)$, (304, 2 $(305, 2.4843)$ 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 $\frac{dy}{dx} = y - x$ where $y(0) = 2$. Find $y(0.1)$ correct to four decimal places by Kutta second order formula.

(9 × 1 = 9 we

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 $0.10 \leq x \leq 0.30$.

x	:	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 $I = \int_0^1 \frac{1}{1+x} dx$ 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 $y' = x - y^2$ and $y(0) = 1$.

28. Using Simpson's rule evaluate $I = \int_0^1 \frac{1}{1+x} dx$ correct to three decimal places. Take $h = 0.5$.

(5 × 2 = 10 weightage)

IV. Answer *two* questions from 3 :

29. Find the Lagrange interpolating polynomial of degree two approximating the function $y = \ln x$ defined by the following table of values.

x	:	2	2.5	3
$y = \ln x$	:	0.69315	0.91629	1.09861

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

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

31. Using Modified Euler's Method determine the value of y when $x = 0.1$ given $y(0) = 1, y' = x^2 + y$.

(2 × 4 = 8 weightage)