5706 (Pages : 3) Name.................................

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

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2012

(CCSS)

Mathematics—Core Course

MM 6B 11—NUMERICAL METHODS

Three Hours Maximum Weightage : 30

Answer all *twelve* questions :

1 Define forward difference operator.

2 Fill in the blanks :

$$y_n - \text{\_\_\_\_\_\_} = \delta y_{n-\frac{1}{2}}$$

3 The shift operator E is defined as $Ey_r =$ ———.

4 $\frac{1}{2}\left(E^{1/2} + E^{-1/2}\right) =$ ———.

(a) δ ; (b) μ ; (c) E ; (d) ∇.

5 Write Newton's forward difference interpolation formula.

6 Define the eigenvalue of a square matrix.

7 $1 + \frac{1}{4}\delta^2 =$ ———.

(a) E^2 ; (b) δ^2 ; (c) μ^2 ; (d) Δ^2.

8 Backward difference $\nabla_{y_1} =$ ———.

9 Write the Trapezoidal Rule.

10 $\nabla E \; \delta E^{1/2} =$ ——— :

(a) E ; (b) μ ; (c) ∇; (d) Δ.

11 Write Gauss Backward Formula.

12 Find the integers between which the real root of $x^3 - x - 1 = 0$ lies.

(12 × ¼ = 3 weightage)

Turn over

II. Answer *all* nine questions :

13 Define central difference operator δ.

14 Prove that $\mu = \sqrt{1 + \frac{1}{4}\delta^2}$.

15 Define averaging operator μ.

16 If $y_1 = 4, y_3 = 12, y_4 = 19$, and $y_x = 7$ find x using Lagrange's formula.

17 Show that

$$e^x \left(u_0 + x\,\Delta u_0 + \frac{x^2}{2!}\Delta^2 u_0 + \ldots\ldots \right) = e^{xE}\, u_0.$$

18 Using the following table find $f(x)$ as a polynomial in x by Newton's General Interpola
Formula :

x	-1	0	3	6	7
$f(x)$	3	-6	39	822	1611

19 Define the spectrum of a square matrix.

20 Write Simpson's $\frac{1}{3}$ – rule.

21 Find the first approximate solution of $y^1 = x + y^2$ subject to the condition $y = 1$ when x
using Picard's method.

(9 × 1 = 9 weight

III. Answer any *five* questions :

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

23 Find the missing term in the following table :

x :	0	1	2	3	4
y :	1	3	9	–	81

24 Using Lagrange's interpolation formula find the form of the function $y(x)$ from the follo
table :

x :	0	1	3	4
y :	-12	0	12	24

25 Using Trapezoidal rule, find from the following table the area bounded by the curve and
x-axis from $x = 7.47$ to $x = 7.52$.

x :	7.47	7.48	7.49	7.50	7.51	7.52
$f(x)$:	1.93	1.95	1.98	2.01	2.03	2.06

26 Use Gauss' elimination to solve :

$$2x + y + z = 10,$$
$$3x + 2y + 3z = 18,$$
$$x + 4y + 9z = 16.$$

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

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

(5 × 2 = 10 weightage)

Answer *two* questions :

29 Using Ramanujan's method find the smallest root of $f(x) = x^6 - 6x^2 + 11x - 6 = 0$.

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

31 The differential equation $y^1 = x^2 + y^2 - 2$ satisfies the following data :—

x :	− 0.1	0	0.1	0.2
y :	1.0900	1.0000	0.8900	0.765

Use Milne's method to obtain the value of y (0.3).

(2 × 4 = 8 weightage)