Reg. No. ....

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2012

(CCSS)

Mathematics—Core Course

MM 6B 11—NUMERICAL METHODS

Time : Three Hours | Maximum Weightage : 30

I. Answer all *twelve* questions :

1 Define forward difference operator.

2 Fill in the blanks :

y_n ———— $= \delta y_{n-\frac{1}{2}}$

3 The shift operator E is defined as Ey_x = ————

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

(a) 8 ; (b) μ ; (0 E ; (d) V •

5 Write Newton's forward difference interpolation formula.

6 Define the eigenvalue of a square matrix.

7 $1 + \frac{\cdot}{4} \frac{2}{=}$ ————

(a) E^2 ; (b) b^2 ; (c) μ ; (d) Δ .

8 Backward difference V_{y1} = ————

9 Write the Trapezoidal Rule.

$\nabla E \;\; \delta E^{1/2}$ = ————

(a) E ; (b) t; (c) V; (d) A.

11 Write Gauss Backward Formula.

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

(12 x $^1/_4$ = 3 weightage)

Turn over

II. Answer *all* nine questions :

13 Define central difference operator S.

14 Prove that $\overline{1 + \frac{1}{4}\delta}$.

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

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

18 Using the following table find $f(x)$ as a polynomial in x by Newton's General Interpolation 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 $x = 0$, using Picard's method.

(9 x 1 = 9 weightage)

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

(5 x 2 = 10 weightage)

IV. Answer *two* questions

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

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 x 4 = 8 weightage)