Roll No. .....

BCA–504(N)

B. C. A. (Fifth Semester)
EXAMINATION, Dec., 2013

(New Course)

Paper Fourth

NUMERICAL METHODS

Time : Three Hours] [*Maximum Marks : 75*

Note : Section A is compulsory. Attempt any *seven* questions out of ten from Section B and any *one* question from Section C.

Section—A
(Numerical/Analytical/Problematic Questions)

1. (a) Show that : 4

$$\Delta \log f(x) = \log \left\{1 + \frac{\Delta f(x)}{f(x)}\right\}$$

(b) Estimate the missing term in the following table :

x	$f(x)$
0	1
1	3
2	9
3	?
4	81

Give the reason why the resulting value differs from 3^3. 4

2. Use Euler's method with $h = 0 \cdot 05$ to find the solution of the differential equation : 7

$$\frac{dy}{dx} = x + y$$

with the initial condition $x_0 = 0, y_0 = 1$, in the range $0 \leq x \leq 0.20$.

Section—B 6 each

(Short Answer Type Questions)

3. Find a root of the equation $x^3 - x - 11 = 0$ correct to three decimals using Bisection method.
4. Using Newton-Raphson method evaluate to two decimal figures, the root of the equation $e^x = 3x$ lying between 0 and 1.
5. Find the third divided difference $f(3, 4, 5, 6)$, where $f(x) = x^3 - x$.
6. Using Gauss elimination method, solve :

$$x + y + z = 6$$
$$3x + 3y + 4z = 20$$
$$2x + y + 3z = 13$$

7. Find $\frac{dy}{dx}$ at $x = 0 \cdot 1$ from the following table :

x	y
0·1	0·9975
0·2	0·9900
0·3	0·9776
0·4	0·9604

8. Calculate the value of $\int_{-3}^{3} x^4\, dx$ by Simpson's $\frac{1}{3}$ rule and compare with the exact value.
9. Calculate $\int_0^6 \frac{dx}{1+x^2}$ by using Simpson's $\frac{3}{8}$ rule. Compare the result with the actual value of the integral.

10. Find $f(10)$ by Lagrange's interpolation formula :

x	$f(x)$
5	12
6	13
9	14
11	16

11. Find the real root of $3x - \cos x - 1 = 0$ by the method of False position.
12. Obtain the function whose first difference is $x^3 + 3x^2 + 5x + 12$.

Section—C 18 each

(Long Answer Type Questions)

13. Use Gauss-Seidel method to solve the system of equations :

$$3x + y + z = 1$$
$$x + 3y - z = 11$$
$$x - 2y + 4z = 21$$

14. Use Runge-Kutta method to approximate y when $x = 0 \cdot 1$ and $x = 0 \cdot 2$, given that $x = 0$ when $y = 1$ and $\frac{dy}{dx} = x + y$.
15. From the following table, find the number of students who obtained less than 55 marks :

Marks	No. of Students
30—40	21
40—50	32
50—60	41
60—70	25
70—80	21