Register Number :

Name of the Candidate :

1 2 6 9

B.Sc. DEGREE EXAMINATION, 2010

(COMPUTER SCIENCE)

(FIRST YEAR)

(PART - III)

(PAPER - II)

130 / 140 / 530 / 541. SCIENTIFIC COMPUTING

[(Common to New and Revised Regulations) B.Sc. Information Technology (New and Revised Regulations B.C.A. - Revised Regulations)]

May] [Time : 3 Hours

Maximum : 100 Marks

Answer any FIVE questions.
All questions carry equal marks.
(5 × 20 = 100)

1. (a) Solve the equation

$$x^3 + x^2 - 1 = 0$$

for the positive root by iteration method.

Turn over

(b) Find an approximate root of

$$x \log_{10} x = 1{\cdot}2.$$

by false position method. (10 + 10)

2. (a) Find the real positive root of

$$3x - \cos x - 1 = 0$$

by Newton - Raphson method correct to 6 decimal places.

(b) By Gauss - elimination method, solve the system

$$3{\cdot}15\,x - 1{\cdot}96\,y + 3{\cdot}85\,z = 12{\cdot}95$$

$$2{\cdot}13\,x + 5{\cdot}12\,y - 2{\cdot}89\,z = -8{\cdot}61$$

$$5{\cdot}92\,x + 3{\cdot}05\,y + 2{\cdot}15\,z = 6{\cdot}88.$$

(10 + 10)

3. (a) Evaluate

$$\int_0^{\pi/2} \sin x \, dx$$

by Simpson's $\frac{1}{3}$ rule dividing the range into six equal parts.

8. (a) Classify the equations

(i) $u_{xx} - 4\,u_{xy} + 4\,u_{yy} = 0.$

(ii) $u_{xx} + u_{yy} = 0.$

(b) Solve :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 8x^2\,y^2$$

in the square mesh given $u = 0$ on the four boundaries dividing the square into 16 sub-squares of length 1 unit.

(5 + 15)

(b) Construct Newton's forward interpolation polynomial for the following data :

x :	4	6	8	10
y :	1	3	8	16

use it to find the value of y for $x = 5$. (10 + 10)

4. (a) Using Stirling's formula, compute y_{35}, given that

$y_{10} = 600$;

$y_{20} = 512$;

$y_{30} = 439$;

$y_{40} = 346$;

$y_{50} = 243$.

(b) Find a polynomial of degree four which takes the values :

x :	2	4	6	8	10
y :	0	0	1	0	0

(10 + 10)

Turn over

5. (a) Using Taylor series method, find y(1·1) and y(1·2) correct to four decimal places given.

$$\frac{dy}{dx} = xy^{1/3} \text{ and } y(1) = 1.$$

(b) Find the value of y(0·1) by Picard's method given

$$\frac{dy}{dx} = \frac{y - x}{y + x} \text{ and } y(0) = 1.$$

(10 + 10)

6. Apply the fourth order Runge - Kutta method to find y(0·1) and y(0·2) given that

$y' = x + y,\ y(0) = 1.$ (20)

7. (a) Solve :

$$y_{n+2} - 2y_{n+1} + y_n = n^2 2^n.$$

(b) Fit a curve of the form

$$y = ax^2 + bx + c$$

for the data given below :

x :	10	20	30	40	50	60
y :	4·5	7·1	10·5	15·5	20·5	27·1