(4243)

2008–2009

B.A. / B.Sc. (HONS.) (PART-I) EXAMINATION

(MATHEMATICS)

NUMERICAL ANALYSIS

(MM – 106)

Maximum Marks : 40 Duration : Three Hours

NOTE : Answer all questions.

1. (a) Find a root correct to three decimal places of the equation $x - \cos x = 0$ by Newton Raphson method. (4,4)

(b) Using Gaussian Elimination method, find the inverse of the matrix.

$$A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & 4 \\ 1 & 2 & 2 \end{bmatrix}$$

OR

(b′) Solve the following system of equations by factorization method :

$$2x + 3y + z = 9$$
$$x + 2y + 3z = 6$$
$$3x + y + 2z = 8$$

2. (a) Using Gauss's backward difference interpolation formula, find the value of f(32), given that f(25) = 0.2707, f(30) = 0.3027, f(35) = 0.3386 ; f(40) = 0.3794 (4,4)

OR

(a′) Use Stirling's formula to find u_{32} from the following data :

$u_{20} = 14.035$; $u_{25} = 13.674$; $u_{30} = 13.257$

$u_{35} = 12.734$; $u_{40} = 12.089$; $u_{45} = 11.309$

(b) Find the Lagrange interpolating polynomial of degree 2 approximating the function $y = \ln x$ defined by following table of values and hence determine the value of ln 2.7

x	2	2.5	3.0
y = ln x	0.69315	0.91629	1.09861

3. (a) Derive Simpson's 3/8 rule (4,4)

$$\int_{x_0}^{x_3} y\,dx = \frac{3}{8}h(y_0 + 3y_1 + 3y_2 + y_3)$$

and use it to evaluate $\int_0^1 \frac{1}{1+x}\,dx$ with $h = \frac{1}{6}$.

OR

Contd.....2

(a) Derive Weddle's rule

$$\int_{x_0}^{x_6} y\,dy = \frac{3h}{10}(y_0 + 5y_1 + y_2 + 6y_3 + y_4 + 5y_5 + y_6)$$

and use it to obtain an approximate value of π from the formula $\frac{\pi}{4} = \int_0^1 \frac{1}{1+x^2}\,dx$.

(b) A curve is given by the points of the table given below:

x	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	23	19	14	11	12.5	16	19	20	20

Calculate the area bounded by the curve, the x-axis and the extreme ordinates.

(a) Determine the value of y at x = 0.1 given that y (0) = 1 and $y' = x^2 + y$ by Euler's method (4,4)

(b) Given the differential equation

$$\frac{dy}{dx} = \frac{x^2}{y^2+1}$$

with initial condition y = 0 when x = 0, obtain y for x = 0.25 ; 0.5 and 1.0 by Picard's method.

OR

(b) Given :

$$\frac{dy}{dx} = 1 + y^2 \;;\; y(0) = 0,$$

Find y (0.2) ; y (0.4) and y (0.6) using second order Runge-Kutta method.

5. (a) Fit a curve $y = ab^x$ to the following data : (4,4

x	2	3	4	5	6
y	144	172.8	207.4	248.3	298.5

(b) Solve any TWO of the following equations :

(i) $u_{x+2} - 4u_x = 9x^2$

(ii) $u_{x+2} - 3u_{x+1} - 4u_x = 3^x$

(iii) $u_{x+2} - 2u_{x+1} + u_x = 3x + 4$

(iv) $u_{x+2} - 7u_{x+1} + 12u_x = \cos x$ with $u_0 = 0 = u_1$.