Examination Roll No.....

YMCA UNIVERSITY OF SCIENCE& TECHNOLOGY, FARIDABAD

M.Sc. MATHEMATICS Semester II (UNDER CBCS)

Numerical Analysis (MTH 508)

Time: 3 Hours Max. Marks:60

Note: 1. *It is compulsory to answer the questions of Part -1.*
2. *Answer any four questions from Part -2.*
3. *Different parts of the same question are to be attempted adjacent to each other.*

PART -1

Q1	(a)	Give the geometrical interpretation of bisection method.	(2)
	(b)	What is extrapolation.	(2)
	(c)	Define Newton's Forward interpolation formula.	(2)
	(d)	State Simpson's 3/8 rule.	(2)
	(e)	What is Quadrature.	(2)
	(f)	What is standard 5-point formula .	(2)
	(g)	What do you understand by predictor –corrector method.	(2)
	(h)	What is the formula and order of convergence of Secant method .	(2)
	(i)	Find the first and second order derivative using Gauss backward difference formula .	(2)
	(j)	Explain Jacobi's method to solve the partial differential equation.	(2)

PART -2

Q2 (a) Find the number of students from the following data who secured marks not more than 45. (5)

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	35	48	70	40	22

(b) Find the cubic Lagrange interpolating polynomial from the following data (5)

X	0	1	2	5
F(x)	2	3	12	147

Q3 (a) Find the root of the equation $x^4 + 2x^3 - x - 1 = 0$ in the interval [0,1] by using Bisection method. (5)

(b) Find the real root of the equation $x^4 - x - 10 = 0$, correct to three decimal places by Newton – Raphson method. (5)

Q4 (a) Evaluate the integral $\int_0^4 e^x \, dx$ by Simpson's $\frac{1}{3}$ rule . (5)

(b) Solve the following system by the Gauss – Seidel method: (5)

$$10x + 2y + z = 9$$
$$2x + 20y - 2z = -44$$
$$-2x + 3y + 10z = 22.$$

Q5 (a) Evaluate the integral $\int_0^6 \frac{dx}{1+x^3}$ by using Weddle's rule. (5)

(b) Use Euler's method with h =0.1 to find the solution of $\frac{dy}{dx} = x^2 + y^2$,y(0)=0 in the range $0 \leq x \leq 0.5$. (5)

Q6 (a) Using Taylor's series method , find the value of y to five places of decimals when x =1.02 , given that $\frac{dy}{dx} = xy - 1, y(1) = 2$. (5)

(b) Using Runge-Kutta method of order 4 ,find y for x = 0.1,0.2,0.3 given that $\frac{dy}{dx} = x - y^2$,y(0)=1. (5)

Q7 Solve the partial differential equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions (10)

u(x,0) = sinΠx, $0 \leq x \leq 1$,

u(0,t)= u(1,t) = 0

using Crank-Nicolson method.

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