HG(3) — Math (8)
Num. Anal.
(Sc. & Arts)

2020

Time : 3 hours

Full Marks : 70

Pass Marks : 32

Candidates are required to give their answers in their own words as far as practicable.

The questions are of equal value.

Answer any five questions.

1. (a) Explain Regula-Falsi Method for solving an algebraic and transcendental equation.

   (b) Solve the equation $3x - \cos x - 1 = 0$ by applying False Position Method.

2. (a) By using Newton-Raphson method, find the root of equation $x^4 - x - 10 = 0$ correct to three places of decimals.

   (b) Find the cube root of 10.

3. (a) Establish Lagrange's interpolation formula for unequal intervals.

   (b) Evaluate $\left(\dfrac{\Delta^2}{E}\right)x^3$.

4. (a) Prove that the nth divided difference of a polynomial of degree n is constant.

   (b) Find the third divided difference with arguments 2, 4, 9, 10 of the function $f(x) = x^3 - 2x$.

5. (a) Establish Euler's method to find the solution of ordinary differential equation of first order.

   (b) Solve the equation $\dfrac{dy}{dx} = x + y$ by Runge-Kutta method with the initial conditions $x_0 = 0$, $y_0 = 1$.

6. (a) Establish Simpson's $\frac{1}{3}$ rule.

   (b) Calculate by Simpson's $\frac{1}{3}$ rule $\int_2^{10} \dfrac{dx}{1+x}$ by dividing the range into eight equal parts.

7. (a) Solve the following systems of equation by using Gaussian ellimination method :

$$x + y + z = 9$$

$$2x - 3y + 4z = 13$$

$$3x + 4y + 5z = 40$$

(b) Solve the following by Gauss-Jordon ellimination method :

$$x + 4y - z = -5$$

$$x + y - 6z = -12$$

$$3x - y - z = 4$$

8. Solve the following system of equations by Gauss-Seidel iteration method :

$$2x + y - 2z = 17$$

$$3x + y - z = -18$$

$$2x - 3y - 20z = 25$$

9. Find the eigen values and eigen vectors of the

matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.

(3) (Turn over)

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10. Write short notes on any **two** of the following :

(a) Relaxation method

(b) Gauss quadrature formula

(c) Picard's method of Successive Approximations

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