

Total No. of Questions : 12]

SEAT No. :

P753

[Total No. of Pages : 3]

[4263] - 215

**T.E. (Mechanical/Automobile)**  
**COMPUTER ORIENTED NUMERICAL METHODS**  
**(2008 Pattern) (Semester - I)**

*Time : 3 Hours]**[Max. Marks : 100]***Instructions to the candidates :**

- 1) Answer three questions from each section.
- 2) Answers to each section should be written in separate books.
- 3) Neat diagram must be drawn wherever necessary.
- 4) Figure to right indicate full marks.
- 5) Assume suitable data if necessary.
- 6) Use of programmable calculator is not permitted.

**SECTION - I**

- Q1)** a) Solve using Newton Raphson Method  $e^x \cdot \cos(x) - 1.4 = 0$ . Find the value of root up to the accuracy of 0.01. [8]  
 b) Draw the flowchart for successive approximation method. [8]

OR

- Q2)** a) Evaluate using Trapezoidal Rule. Take  $h = k = 0.5$  [8]

$$\int_0^1 \int_0^1 e^{(x+y)} dx dy$$

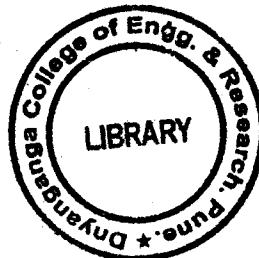
- b) Explain the trapezoidal rule, Simpson's 1/3<sup>rd</sup> method and Simpson's 3/8<sup>th</sup> rule, using graphical representation. [8]

- Q3)** a) Following table shows enthalpy at different pressures. Find out the enthalpy at pressure of 2.1 bar using suitable interpolation method. [8]

Pressure (bar)	1.9	2.2	2.4	2.6
Enthalpy (kJ/kg °K)	497.9	517.6	529.6	540.9

- b) Draw the flowchart for calculation and printing of forward difference table. [8]

OR



P.T.O.

- Q4) a)** Find  $dy/dx$  at  $x = 0.2$  for following data points.

$x$	0.2	0.4	0.6	0.8	1
$y$	0.81873	0.67032	0.54881	0.44933	0.36787

- b)** For a hydrodynamic bearing, the temperature viscosity relationship is given as follows : [8]

t in $^{\circ}\text{C}$	40	41	42	43	44	45
$\mu$ in cp	52.5	50	47.5	45	43	41

Calculate the viscosity of the lubricant for the temperature of  $43.2^{\circ}\text{C}$ .

- Q5) a)** Solve the following set of simultaneous equations using Gauss Elimination Method. [10]

$$10x_1 + x_2 + x_3 = 12$$

$$2x_1 + 11x_2 + 2x_3 = 15$$

$$3x_1 + 4x_2 + 9x_3 = 16$$

- b)** Draw the flowchart for the Gauss Seidal with relaxation method. [8]

OR

- Q6) a)** Solve the following set of simultaneous equations using Gauss Seidal Method. [10]

$$9x_1 + 2x_2 + 4x_3 = 20$$

$$x_1 + 10x_2 + 4x_3 = 6$$

$$2x_1 - 4x_2 + 10x_3 = -15$$

- b)** Draw the flowchart for Thomas Algorithm for Tri-diagonal Matrix. [8]

## SECTION - II

- Q7) a)** Determine the values of a and b so that the equation  $Q = ah^b$  best fits the following data by the method of least squares : [10]

h :	25	20	12	9	7	5
Q :	0.22	0.2	0.15	0.13	0.12	0.1

- b)** Derive least square criteria for straight line. [6]

OR

- Q8) a)** The pressure of the gas corresponding to various volume V is measured, given by the following data : [10]

V ( $\text{cm}^3$ ) :	50	60	70	90	100
P ( $\text{kg}/\text{cm}^2$ ) :	64.7	51.3	40.5	25.9	78

Fit the data to the equation  $P \propto V^n = C$

b) Explain types of errors with suitable example :

- i) Rounding Error.
- ii) Truncation Error.
- iii) Absolute Error.
- iv) Relative Error.

**Q9)** a) An object having surface area of  $0.1\text{m}^2$  is initially at  $0^\circ\text{C}$  is dipped in a hot water bath. Water is initially at  $95^\circ\text{C}$ . Find the temperature of object after 10 sec, taking  $\delta t = 2 \text{ sec}$ .

Take mass of the object 1.2 kg,  $C_p = 450 \text{ J/kg K}$ , heat transfer coefficient =  $1200 \text{ W/m}^2\text{k}$ . ( $dT/dt = h*A(T - T_f)/-m*C_p$ ). [10]

b) Draw flow chart for solution of simultaneous differential equations. [6]

OR

**Q10)** a) Using 'Runge Kutta method of order 4, find  $y$  for  $x = 0.1, 0.2, 0.3$  given that  $dy/dx = xy + y^2$ ,  $y(0) = 1$ . Continue the solution at 0.4 using Milne's method. [10]

b) Draw flowchart for 'Modified Euler's Method'. [6]

**Q11)** a) Solve  $\delta^2 u / \delta t^2 = 4 \cdot \delta^2 u / \delta x^2$  with boundary conditions  $u(0, t) = u(4, t) = 0$  and the initial condition  $u_t(x, 0) = 0$  and  $u(x, 0) = x(4 - x)$  taking  $h = 1$ ,  $k = \frac{1}{2}$ . [10]

b) Draw a flowchart for solving Elliptical equation. [8]

www.sppuonline.com OR

**Q12)** a) Solve the equation  $\nabla^4 u = -10(x^2 + y^2 + 10)$  over the square with sides  $x = 0, y = 0$  and  $x = 3, y = 3$  with  $u = 0$  on the boundary and the mesh length = 1. [10]

b) Draw a flowchart for solving Laplace's equation. [8]

