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Numerical Methods Applications in Civil Engineering
(1050)

P. Pages : 3

Time : Three Hours **Max. Marks : 100**

Instructions to Candidates :
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with blue ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Figures to right indicates full marks.
6. Use of non-programmable calculator is allowed.
7. Assume suitable data if necessary.

UNIT – I

1. a) Draw the flowchart for Gauss Elimination method. **5**

b) What is the use of Numerical methods in computation of different types of problem. **5**

2. Find by Newton-Raphson method a root of following equations correct to three decimal places. **10**

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

ii) $x = \cos x.$

3. a) Solve by Gauss. Elimination method. **5**

$3x + 4y + 5z = 18$

$2x + (-y) + 8z = 13$

$5x - 2y + 7z = 20$

b) Solve by Gauss-Jorden method. **5**

$10x + y + z = 12$

$2x + 10y + z = 13$

$x + y + 5z = 7$

UNIT – II

4. A firm uses lathes, milling and grinding machines to produce 2 machines parts. Table below represents the machining times required for each part, the machining times available on different machines and the profit on each machine part. **10**

Tyep of machine	Machining for machine	Time required part (min)	maximum time available per week (min)
	I	II	
Lathes	12	6	3,000
Milling Machine	4	10	2,000
Grinding Machine	2	3	900
Profit per unit	Rs. 40	Rs. 100	

Find the number of parts I and II to be manufactured per week to maximize the profit.

5. What is simplex method. Explain slack and surplus variables. **10**

6. Solve the following L.P.P. by using simplex method for minimizaton. **10**

$$Z\min = x_1 - 3x_2 + 2x_3$$

$$\text{constraints,} \quad 3x_1 - x_2 + 3x_3 \le 7$$

$$-2x_1 + 4x_2 \le 12$$

$$-4x_1 + 3x_2 + 8x_3 \le 10$$

$$x_1, x_2, x_3 \ge 0$$

UNIT – III

7. a) Using Lagrange's formula of interpolation find y(9.5). **5**

x	7	8	9	10
y	3	1	1	9

b) Write an algorithm to fit a straight line. **5**

8. Fit a parabola, by the method of least square, to the following data. **10**
Also estimate y at x=6.

x	1	2	3	4	5
y	5	12	26	60	97

9. The population of the town is as follows. **10**

Year	x	1941	1951	1961	1971	1981	1991
Population in lakhs	y	20	24	29	36	46	51

Estimate the population increase during the period 1946 to 1976.

UNIT – IV

10 Evaluate $\int_0^1 \sqrt{\sin x + \cos x} \cdot dx$. Correct up to 2 decimal places using seven ordinates. By Trapezoidal, Simpson's $\frac{1}{3}^{rd}$ and Simpson's $\frac{3}{8}^{th}$ rule. **10**

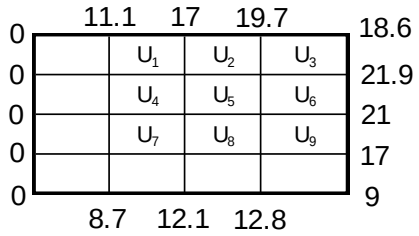
11. Evaluate $\int_0^{3\pi/20} (1 + 2\sin x) \cdot dx$ by using Gaussian Quadrature 2 point and 3 point formula. **10**

12. The table given below reveals the velocity V of a body during the time 't' specified. Find its acceleration at t=1.1, by Newtons forward formula of differentiation. **10**

t	1	1.1	1.2	1.3	1.4
V	43.1	47.7	52.1	56.4	60.8

UNIT – V

13. Solve the following value of interior lattice point by Laplace equation. **10**



14. a) Apply Runge Kutta fourth order method to find the value of y when x=0.2, given that $\frac{dy}{dx} = x + y$ and y=1 when x=0. **5**

b) Discuss in brief different types of boundary conditions. **5**

15. Determine the value of y(0.4). Using Milne's method $y^1 = xy + y^2$, $y(0) = 1$, Use modified Euler's method to get the value of y(0.1), y(0.2) & y(0.3). **10**

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