C 1127 **(Pages : 4)** Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) (09 SCHEME) DEGREE EXAMINATION, APRIL 2016

EE/PTEE 09 L 02—NUMERICAL ANALYSIS AND OPTIMIZATION TECHNIQUES

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

I. (a) Prove that $\Delta \log f(x) = \log\left(1 + \frac{\Delta f(x)}{f(x)}\right)$.

(b) Use Trapezoidal rule to evaluate $\int_0^1 x^3 dx$.

(c) Find the basic feasible solution of :

$$2x_1 + x_2 + 4x_3 = 11$$
$$3x_1 + x_2 + 5x_3 = 14.$$

(d) Define balanced transportation problem.

(e) If D stands for the differential operator $\frac{d}{dx}$, prove that :

$$D = \frac{1}{h}\left[\Delta - \frac{1}{2}\Delta^2 + \frac{1}{3}\Delta^3 \ldots\right].$$

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

II. (a) Given :

θ	:	0°	5°	10°	15°	20°	25°	30°
$\tan\theta$	:	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

Use Stirling's formula, show that :

$\tan 16^\circ = 0.28671$.

(b) Find the real root of the equation $x^4 - x - 9 = 0$ by Newton's Raphson method. Correct to three places of decimal.

Turn over

(c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $(3/8)^{th}$ rule taking $h = 1/6$.

(d) Construct the dual of the L.P.P.

Maximize $z = 4x_1 + 9x_2 + 2x_3$

subject to $2x_1 + 3x_2 + 2x_3 \leq 7$

$3x_1 - 2x_2 + 4x_3 = 5$

$x_1, x_2, x_3 \geq 0$.

(e) Explain the working procedure of dual simplex method.

(f) Construct the transportation table for the following transportation problem and obtain the initial basic feasible solution :

		Destination A	B	C	D		
Source	I	21	16	25	13	11	Availability
	II	17	18	14	23	13	
	III	33	27	18	41	19	
Destination		6	10	12	15	43	

(4 × 5 = 20 marks)

Part C

Answer Section A **or** *Section B of each question.*

III. A Using Gauss-Seidel iteration method solve the system of equations :

$$10x - 2y - z - w = 3$$
$$-2x + 10y - z - w = 15$$
$$-x - y + 10z - 2w = 27$$
$$-x - y - 2z + 10w = -9.$$

Or

B Using relaxation method, solve the system of equations :

$$9x - y + 2z = 9$$
$$x + 10y - 2z = 15$$
$$2x - 2y - 13z = -17.$$

IV. A Using Runge-Kutta fourth order method. Compute y (0.1) and y (0.2) if y (x) satisfies $\frac{dy}{dx} = x + yx^2$ with y (0) = 1.

Or

B Using Milne's predictor and corrector formulae, compute y (4.4) and y (4.5) if y (x) satisfies $\frac{dy}{dx} = \frac{2 - y^2}{5x}$ with the values :

x	:	4	4.1	4.2	4.3
y	:	1	1.0049	1.0097	1.0143

V. A Using Simplex method to solve :

Maximize $z = 5x_1 + 3x_2$

subject to
$$x_1 + x_2 \leq 2$$
$$5x_1 + 2x_2 \leq 10$$
$$3x_1 + 8x_2 \leq 12$$
$$x_1, x_2 \geq 0.$$

Or

B Using Charne's M method to solve :

Minimize $z = 2x_1 + x_2$

subject to
$$3x_1 + x_2 = 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 3$$
$$x_1, x_2 \geq 0.$$

VI. A Four jobs are to be done on four different machines. The cost (in rupees) of producing i^{th} job on the j^{th} machine is given below :

		Machines			
		M_1	M_2	M_3	M_4
Jobs	J_1	15	11	13	15
	J_2	17	12	12	13
	J_3	14	15	10	14
	J_4	16	13	11	17

Assign the jobs to different machines so as to minimize the total cost.

Or

B Solve the following transportation problem :

Supplies / Consumer	A	B	C	Available
I	6	8	4	14
II	4	9	8	12
III	1	2	6	5
Required	6	10	15	31

(4 × 10 = 40 marks)