B.E. Sixth Semester (Electro. & Power, Elect. & Power, Electrical Engg.) (CGS)

10562 : Optimisation Techniques : 6 EP 02 / 6 EL 02 / 6 EX 02 / 6 EE 02

P. Pages : 4 | AU - 2755

Time : Three Hours | Max. Marks : 80

* 0 7 3 9 *

Notes : 1. Answer **three** question from section A and **three** question from section B.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.

SECTION - A

1. a) State the limitations and applications of classical Optimization Techniques. 7

b) Find the maxima and minima of the function 6

$$f(x_1, x_2) = x_1^3 + x_2^2 - 3x_1 + 12x_2 + 25$$

OR

2. a) Using Lagrange Multiplier method find the maxima of the function 7

$f(x_1, x_2) = 2x_1 + x_2 + 10$ subject to $x_1 + 2x_2^2 = 3$

b) Explain the Direct substitution method of classical optimization technique. 6

3. a) Write a short note on Linear programming problem. 5

b) A manufacturer produces four types of products A, B, C and D, by using two types of machines Lathe machine and milling machine. The time required for all the two types of machine to manufacture one unit of each of four products, the profit per unit of the product and the total time available on the two machines per day are given by, 8

Machine	Product Time				Total Time
	A	B	C	D	
Lathe	7	10	4	9	1200
Milling	3	40	1	1	800
Profit per unit	45	10	30	50	

Find the number of units to be manufactured of each product per day for maximizing the profit. Use simplex method.

OR

4. a) Solve the following LPP by graphical method. 6

Maximize $Z = 5x_1 + 3x_2$

STC $2x_1 + 5x_2 \leq 10$

$5x_1 + 2x_2 \leq 10$

$2x_1 + 3x_2 \geq 6$

$x_1, x_2 \geq 0$

b) Solve the following LPP by simplex method. 7

Maximize $Z = -x_1 + 2x_2$

STC $x_1 + 2x_2 \le 4$

$2x_1 + 5x_2 \le 10$

$x_1, x_2 \ge 0$

5. a) Solve the following LPP by Dual simplex method. 7

Minimize $Z = x_1 + x_2$

STC $2x_1 + x_2 \ge 2$

$-x_1 - x_2 \ge 1$

$x_1, x_2 \ge 0$

b) Consider the following LPP 7

Maximize $Z = 6x_1 + 8x_2$

STC $5x_1 + 10x_2 \le 60$

$4x_1 + 4x_2 \le 40$

$x_1, x_2 \ge 0$

The optimum solution of the above LPP is as shown in the table below,

Basis	C_B	C_j	6	8	0	0	Sol^n
			x_1	x_2	s_1	s_2	
x_2	8		0	1	$1/5$	$-1/4$	2
x_1	6		1	0	$-1/5$	$1/2$	8
	Z_j		6	8	$2/5$	1	
	$Z_j - C_j$		0	0	$2/5$	1	

a) If the right hand side constants of constraint 1 and 2 are changed from 60 to 40 to 40 and 20 resp. then whether the optimum sol^n gets changed?

b) If yes get the new solution.

OR

6. Solve the following transportation problem using 14

1) NWCM 2) LCM 3) VAM

Destination → / Source ↓	D	E	F	G	Supply a_i
A	20	22	17	4	120
B	24	37	9	7	70
C	32	37	20	15	50
Demand b_j	60	40	30	110	

SECTION - B

7. Minimize $f(x) = 0.65 - \frac{0.75}{1+x^2} - 0.65x \tan^{-1}\left(\frac{1}{x}\right)$ 13

in the internal [0,3] by Fibonacci Method using n = 6.

OR

8. a) Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the point $x_1 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ 7

by using steepest descent method. Perform three iterations only.

b) Write a short note on 6

i) Nonlinear Optimization ii) Unimodal function

9. An established company has decided to launch or add a new product to its line. It will duy the product from the manufacturing concern, package it, and sell it to a number of distributors that have been selected on a geographical basis. Market research has already indicated the volume expected and the size of sales force required. The steps shown in the following table are to be planned. 13

Activity	Description	Predecessor	Duration (week)
A	Organize sales office	---	6
B	Hire salesman	A	4
C	Train salesman	B	7
D	Select Advertising Agency	A	2
E	Plan Advertising Campaign	D	4
F	Conduct Advertising Campaign	E	10
G	Design Package	---	2
H	Ste up Packaging Facilities	G	10
I	Package Initial Stocks	J,H	6
J	Order stock from manufacture	---	13
K	Select distributor	A	9
L	Sell to distributor	C,K	3
M	Ship stocks to distributor	I,L	5

i) Draw the network diagram
ii) Draw the critical path
iii) Find the expected project completion time
iv) For each activity find the total and free float.

OR

10. Consider the details of the project as shown in the table below. 13

Activity	Immediate Predecessor	Normal Time (Week)	Normal cost (Rs)	Crash Time (Week)	Crash cost (Rs)
A	---	6	600	4	750
B	A	5	400	4	450
C	A	6	1200	3	1650
D	A	7	1000	4	1360
E	B	10	500	8	550
F	C,E	5	800	4	910
G	D	4	1500	3	1660

If the indirect cost is Rs. 100 per week, Find the crashed duration of the project with optimal total cost.

11. Write a note on **14**

i) Dynamic programming

ii) Multistage division process

iii) Bellman principal of optimality.

iv) Applications of Dynamic programming.

OR

12. Solve the following LPP by Dynamic Programming. **14**

Max $Z = 50x_1 + 100x_2$

STC $10x_1 + 5x_2 \leq 2500$

$4x_1 + 10x_2 \leq 2000$

$x_1 + 1.5x_2 \leq 450$

$x_1, x_2 \geq 0$

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