IE9205

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M.Tech. (Sem. I) Examination, February - 2010
Digital Communication (Full Time)
(1MDC4.2 (Elective) Optimization Techniques)

Time : 3 Hours] [Total Marks : 100

[Min. Passing Marks :

Attempt any five questions. Marks of questions are indicated against each question. Draw neat and comprehensive sketches wherever necessary to clearly illustrate your answer. Assume missing data suitably if any and specify the same.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. Nil 2. Nil

1 (a) A firm manufacturing two types of electrical items A and B, can make a profit of Rs. 20 per unit of A and Rs. 30 per unit of B. Each unit of A requires 3 motors and 2 transformers and each unit of B requires 2 motors and 4 transformers. The total supply of these per month is restricted to 210 motors and 300 transformers. Type B is an export model requiring a voltage stabilizer which has a supply restricted to 65 units per month. Formulate the linear programming problem for maximum profit and solve it graphically. 10

(b) Find all B.S. for the following system of equations and show that all of them are non degenerate :

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

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2 (a) Solve the following L.P.P. by simplex method :

Max. $Z = 5x_1 + 3x_2$

St. : $3x_1 + 5x_2 \le 15$
$5x_1 + 2x_2 \le 10$

and $x_1, x_2 \ge 0$.

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(b) Solve the following L.P.P. by simplex or Big M-Method :

Min. : $Z = x_1 + x_2$

St. : $2x_1 + x_2 \ge 4$
$x_1 + 7x_2 \ge 7$

and $x_1, x_2 \ge 0$.

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3 (a) Solve the following L.P.P by two phase method :

Min. : $Z = 2x_1 + 9x_2 + x_3$

S.t. : $x_1 + 4x_2 + 2x_3 \ge 5$ –
$3x_1 + x_2 + 2x_3 \ge 4$ –

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

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(b) Use revised simplex method to solve the following L.P.P. :

Max. : $Z = 6x_1 - 2x_2 + 3x_3$

S.t. : $2x_1 - x_2 + 2x_3 \le 2$
$x_1 + 4x_3 \le 4$

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

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4 (a) A company is spending Rs. 1000 on transportation of its units to four warehouses from three factories. What can be the maximum saving by optimal scheduling. Solve the following transportation problem :

Factory ↓	Warehouses W_1	W_2	W_3	W_4	Factory capacity
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Warehouses requirement	5	8	7	14	34

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(b) Solve the following transportation problem :

From ↓	← To → D_1	D_2	D_3	Available units
01	2	7	4	5 ($=a_1$)
02	3	3	1	8 ($=a_2$)
03	5	4	7	7 ($=a_3$)
04	1	6	2	14 ($=a_4$)
Demand	7 ($=b_1$)	9 ($=b_2$)	18 ($=b_3$)	34

by North-west corner Rule and Lowest cost entry method and give remark on these two.

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5 (a) There are five jobs to be assigned, one each to five machines and the associated cost matrix is as follows. Solve the following assignment problem :

Jobs ↓	← Machine → I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

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(b) The matrix of setup costs is given below :

	A_1	A_2	A_3	A_4	A_5
A_1	∞	2	6	7	1
A_2	6	∞	3	8	2
A_3	8	7	∞	4	7
A_4	12	4	6	∞	5
A_5	1	3	2	8	∞

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6 (a) Compare the os of the following LPP and its dual :

Min. : $Z_p = 6x_1 + 12x_2$

S.t. : $x_1 + 4x_2 \geq 7$

$2x_2 + 3x_2 \geq 5$

and $x_1, x_2 \geq 0$

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(b) Find the maximum value of the function

$$f(x) = \begin{cases} x_2 & x \leq 2 \\ -x+3 & x > 2 \end{cases}$$

by using unrestricted search method with initial values $s = 0.4$ and step size $s = 0.4$.

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7 (a) Find the minimum of the function

$f(x) = x^3 - 3x^2 + 2$

by quadratic interpolation method.

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(b) Use Golden section method to find maximum of $f(x) = x(5-x)$ given that $f(x)$ is an unimodal function in (0, 8) in which the optimum lies.

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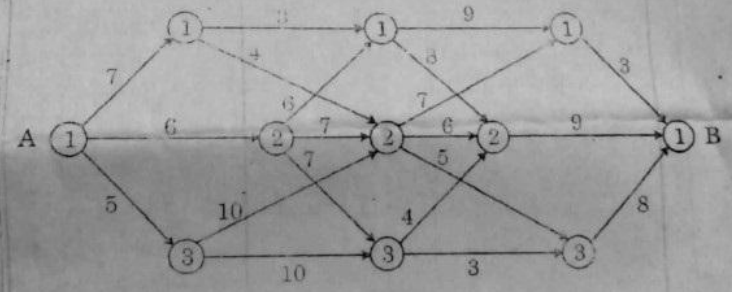
8 (a) Find the shortest path from vertex A to B along arcs joining various vertices lying between A and B in the following figure. Distance of each path is mentioned over the arrow.



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(b) Solve the following problem by using dynamic programming :

Min. $Z = y_1^2 + y_2^2 + y_3^2$

S.t. : $y_1\ y_2\ y_3 \geq 27$

and $y_1, y_2, y_3 > 0$

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