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SF-7755

B. E. - IV (Sem - VIII) (Electrical) Examination

May / June – 2011

Optimisation Methods

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 4 (Sem - 8) (Electrical)**

Name of the Subject :

☛ **Optimisation Methods**

☛ Subject Code No. : **7 7 5 5** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Please write answers in point wise and try to avoid essay type answers.
(3) Due weightage will be given to neat and clean answer sheets.
(4) Write both sections in separate answer sheets.
(5) Make assumptions wherever you feel required.

SECTION - I

1 Solve any **two** : **18**

(a) An automobile company is planning its Diwali advertising campaign to unveil the new models for the coming year. The marketing department has assembled the following data : **8**

* The company would like to limit their TV advertising expenses $ 3 million and buy at least five prime the sports and at least four nonprime time sports.
* They would like to buy a minimum of 6 radio advertising units, and at least 9 advertising units in newspaper and magazines.
* They also want make sure that their message reaches at least 30 million youth viweres.

It is required to devise an advertising campaign costing no more than $ 12 million that reaches as many viewres as possible, subject to these constraints.

Formulate this as a linear programming model. SOLUTION IS NOT REQUIRED :

Medium	Cost/Spot	Viewers/spot (in millions)	
		All viewers	Youth
TV-prime time	$ 100,000	6	2.5
TV-Nonprime time	$ 78,000	4	1.5
Radio	$ 40,000	2.5	1
Newspapers & magazines	$ 20,000	1	0.4

(b) Solve by Big M method : **10**

Minimize z=4x1+x2

Subject to : 3x1+2=3

4x1+3x2>=6

x1+2x2<=4

x1, x2=0.

2 Attempt any **two** : **20**

(a) Obtain the dual of the following example, solve it and from the solution of the dual obtain the solution of the Primal **10**

Minimize z = $2x_1 + 3x_2 + 5x3 + 3x4 + 2x5$

Subject to : $x_1 + x_2 + 2x_3 + 3x_4 + x_5 >= 4$

$2x_1 - 2x_2 + 3x_3 + x_4 + x_5 >= 3$

$X_i >= 0$.

(b) Use the Lagrange multiplier method to solve the following NLP problem. Does the solution maximisa or minimize the objective function ? **10**

$f(x) = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$

Subject to : $g(x) = x_1 + x_2 + x_3 = 20$ $X_i >= 0$.

(c) Find the optimum solution of the following constrained multivariable problem by the method of substitution **10**

Minimise $Z = x_1^2 + (x_2 + 1)^2 + (x_3 - 1)^2$

Subject to : $x_1 - 5x_2 - 3x_2 = 6$.

3 Attempt any **one** : **12**

(a) Solve by revised simplex method :

Maximize $z = 3x_1 + 5x_2$

Subject to : $x_1 <= 4$

$x_2 <= 6$

$3x_1 + 2x_2 =< 18$

All $x >= 0$.

(b) Solve by any Gomory's cutting plane method :

Maximize $z = 2x_1 + 20x_2 - 10x_3$

Subject to : $2x_1 + 20x_2 + 4x_3 <= 15$

$6x_1 + 20x_2 + 4x_3 = 20$

$Xi >= 0$ and are integers.

SECTION - II

4 (a) Five operators have to assigned to five machines. The assignment cost are given in the following table. Operator A can not operate machine III and operator C cannot operate machine IV. Find the optimal assignment schedule. **6**

Machine

(Operators)	I	II	III	IV	V
A	5	5	–	2	6
B	7	4	2	3	4
C	9	3	5	–	3
D	7	2	6	7	2
E	6	5	7	9	1

(b) Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in following table : **6**

Job

Man	I	II	III	IV	V
A	2	9	2	7	1
B	6	8	7	6	1
C	4	6	5	3	1
D	4	2	7	3	1
E	5	3	9	5	1

Find the assignment of men to jobs that will minimize the total time taken.

(c) Solve the following transportation problem in which cell entries represent unit costs. **8**

To

From				Available
	2	7	4	5
	3	3	1	8
	5	4	7	7
	1	6	2	14
Required	7	9	18	34

(d) Determine the optimum basic feasible solution to the following transportation problem. **6**

		To			
		A	*B*	*C*	*Available*
From		50	30	220	1
		90	45	170	3
		250	200	50	4
	Re*quired*	4	2	2	

5 Attempt any **one** : **12**

(a) Use Kuhn-Tucker condition to solve the following non-linear programming problem.

Maximize

$$z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$$

Subject to constrains

$$x_1 + x_2 \leq 2$$

$$2x_1 + 3x_2 \leq 12$$

$$x_1,\ x_2 \geq 0.$$

(b) Use Wolfe's method to solve the quadratic programming problems :

Maximize $z = 2x_1 + 3x_2 - 2x_1^2$

Subject to constrains

$$x_1 + 4x_2 \leq 4$$

$$x_1 + x_2 \leq 2$$

$$x_1,\ x_2 \geq 0.$$

6 (a) Attetmpt any **one** :

Using Fibonacci search method, find the maximization of the function.

$$f(x) = (15 - x)^2 (x - 5)$$

in the interval [5, 15]. Assume permissible error in x to be 0.1.

(b) Using golden section method, maximize the function :

$f(x) = (x-3)^2 (7-x)$ in the interval [3, 7]. Assume error in x to be 0.1
