Registration no: | | | | | | | | | | |

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B.TECH
HSSM3302

5^{th} Semester Regular / Back Examination 2015-16
OPTIMIZATION IN ENGINEERING
BRANCH: AEIE,CHEM,EC,EIE,ETC,IEE
Time: 3 Hours
Max Marks: 70
Q.CODE: T660

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**

a) How one can convert primal optimal solution to dual optimal solution?

b) If the cost of any basic variable is disturbed, then which characteristic of the optimal table may change?

c) If any of the source component is disturbed, then which characteristic of the optimal table may change.

d) What is the mathematical representation of transportation problem?

e) What is the mathematical representation of assignment problem?

f) Is it possible to claim assignment problem as a special case of transportation problem? If so, justify with reason.

g) What is a degenerate solution in transportation problem? What is the nature of the solution given below with justification ?

5		3	
2		4	
	1		1

h) How Hessian matrix is useful for optimality of multi-variable function?

i) What is the expression for N_s and N_q in terms of arrival rate α and departure rate β in an infinite length queue ?

j) What is the relation between W_s and W_q in terms of arrival rate α and departure rate β in an infinite length queue?

Q2 **a)** A carpenter has to manufacture chairs and tables from a available resources, which consists of 400 cube feet of wood and 450 labour-hours. Again, the carpenter gets profits \$45 and \$80 out of a chair and table respectively. If the carpenter needs 5 cube feet of wood and 10 labour-hours for a chair, and 20 cube feet of wood and 15 labour-hours for a table, then formulate the linear programming problem to get maximum total profit **(5)**

b) Solve the linear programming problem using graphical method without graph paper **(5)**

maximize $F(X) = 45x_1 + 80x_2$

subject to the conditions

$$x_1 + 4x_2 \le 80$$
$$2x_1 + 3x_2 \le 90$$
$$X = (x_1, x_2)^T \ge 0$$

Q3 **a)** Find the dual of the given primal linear programming problem **(5)**

maximize $F(X) = 45x_1 + 80x_2$

subject to the conditions

$$x_1 + 4x_2 \le 80$$
$$2x_1 + 3x_2 \ge 90$$
$$X = (x_1, x_2)^T \ge 0$$

b) Find the optimal solution of the following linear programming problem using penalty method **(5)**

minimize $F(X) = 80x_1 + 90x_2$

subject to the conditions

$$x_1 + 2x_2 \ge 45$$
$$4x_1 + 3x_2 \ge 80$$
$$X = (x_1, x_2)^T \ge 0$$

Q4 Give precise answer using simplex table.

a) Solve the following linear programming problem using dual simplex procedure **(5)**

minimize $F(X) = 45x_1 + 80x_2$

subject to the conditions

$$x_1 + 4x_2 \ge 80$$
$$2x_1 + 3x_2 \ge 90$$
$$X = (x_1, x_2)^T \ge 0$$

b) Solve the following linear programming problem using revised simplex procedure **(5)**

maximize $F(X) = 45x_1 + 80x_2$

subject to the conditions

$$x_1 + 4x_2 \ge 80$$
$$2x_1 + 3x_2 \le 90$$
$$X = (x_1, x_2)^T \ge 0$$

Q5 Answer in detail in compact form.

a) Find the integer solution using branch & bound method **(5)**

minimize $F(X) = 2x_1 + 3x_2$

subject to the conditions

$$4x_1 + 5x_2 \ge 13$$
$$X = (x_1, x_2)^T \ge 0$$

b) Find the optimal solution of the minimization assignment problem whose cost matrix is **(5)**

1	4	6	3
9	7	10	9
4	5	11	7
8	7	8	5

Q6 Give the detail derivation.

a) Find the initial solution of the following transportation problem using Vogel's approximation method. **(5)**

5	3	4	6	5
1	2	5	7	10
4	5	2	8	5
3	7	6	4	

b) Optimize the initial solution obtained in question (6a) using steeping stone method. **(5)**

Q7 Formulate non-linear programming problem in required form.

a) Show that the minimum length of the crease, when one corner of a long rectangular sheet of paper of width 1 foot is folded over so as to reach the opposite edge of the sheet, is $\frac{3\sqrt{3}}{4}$ feet. **(5)**

b) A rectangular box of height a and width b is placed adjacent to a wall. Formulate the non-linear programming problem for the length of the shortest ladder that can be made to lean against the wall. **(5)**

Q8 Solve the quadratic programming problem using Wolf's method **(10)**

minimize $f(X) = 2x_1^2 + 2x_1x_2 + 2x_2^2$

subject to the condition

$$x_1 + 2x_2 = 2$$

$$X = (x_1, x_2)^T \geq 0$$