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SARDAR PATEL UNIVERSITY
BCA (V Semester) Examination
Monday, 16 March 2015
10.30 am - 1.30 pm
US05FBCA01 - Operations Research

Total Marks: 70

Q.1 Multiple Choice Questions. **[10]**

1. Operations research is the application of _____methods to arrive at the optimal solutions to the problems.
   A. Economical B. Scientific
   C. [A] and [B] both D. Artistic
2. In non-degenerate solution number of allocated cell is_____.
   A. Equal to m+n-1 B. Not equal to m+n-1
   C. Equal to m+n+1 D. Not equal to m+n+1
3. _____ operation is carried out on a machine at a time.
   A. Two B. Only one
   C. At least one D. None of them.
4. The linear function of variables which is to be maximized or minimized is called _____
   A. Constraints B. Basic requirements
   C. Objective function D. none of them
5. Number of basic allocation in any row or column in Assignment Problem can be _____
   A. Exactly one B. At least one
   C. At most one D. None of them
6. Activity which is completed before starting new activity is called _____.
   A. Dummy B. Predecessor
   C. Successor D. None of them
7. The coefficient of slack variable in the objective function is _____.
   A. –M B. +M
   C. 0 D. None of them
8. Burst and Merge are types of _____ in networking.
   A. Event B. Activity
   C. Arrow D. Tools
9. For the constraint of greater than equal to type we make use of _____ variable.
   A. Slack B. Surplus
   C. Artificial D. Basic
10. The _____ method used to obtain optimum solution of travelling salesman problem.
    A. Simplex B. Hungarian
    C. Dominance D. Graphical

Q.2 Answer the following questions in short. (Attempt any ten) **[20]**

1) Define i] Solution ii] Basic solution.
2) Define and explain slack variables with example.
3) What do you mean by balanced transportation problem?
4) Define feasible solution.
5) Give mathematical form of assignment problem.
6) Define LPP in the mathematical form.
7) What is the condition for optimality in simplex table?
8) How will you allocate jobs in a sequence if two jobs on first machine have same processing time?
9) Define and explain surplus variables with example.
10) Write down any two assumptions used for solving sequencing problem.
11) What is successor activity?
12) What is travelling salesman problem?

Q.3(A) Solve the following LPP by graphical method: **[06]**

Maximize $Z = 6X_1 + 8X_2$

Subject to $5X_1 + 10X_2 \leq 60$,

$4X_1 + 4X_2 \leq 40$, $X_1, X_2 \geq 0$

(B) Note down the applications of operations research. **[04]**

OR

Q.3(A) A manufacturer has two machines A and B. He manufactures two products P and Q on these two machines. For manufacturing product P he has to use machine A for 3 hours and machine B for 6 hours, and for manufacturing product Q he has to use machine A for 6 hours and machine B for 5 hours. On each unit of P he earns Rs. 14 and on each unit of Q he earns Rs. 10. How many units of P and Q should be manufactured to get the maximum profit? Each machine cannot be used for more than 2100 hours. Formulate as LPP. **[06]**

(B) Mention the limitations of operations research. **[04]**

Q.4(A) Solve the following using Simplex Method: **[06]**

Maximize $Z = 3X_1 + 5X_2$

Subject to $X_1 + X_2 \leq 4$,

$3X_1 + 2X_2 \leq 18$, $X_1, X_2 \geq 0$

(B) Write the standard form of LPP for the following LPP: **[04]**

Maximize $Z = 13X_1 + 25X_2$

Subject to $21X_1 + 3X_2 \leq 40$,

$5X_1 + 2X_2 \leq 7$, $X_1, X_2 \geq 0$

OR

Q.4(A) Solve the following using Big-M Method: **[06]**

Maximize $Z = 3X_1 - X_2$

Subject to $2X_1 + X_2 \geq 2$, $X_1 + 3X_2 \leq 3$, $X_1, X_2 \geq 0$

(B) Explain the condition for entering variable in simplex table with suitable example. **[04]**

Q.5(A) Obtain the optimal solution for the following transportation problem: **[06]**

	Warehouses				Supply
	W1	W2	W3	W4	
F_1	19	30	50	10	7
F2	70	30	40	60	9
F3	40	8	70	20	18
Demand	5	8	7	14	

(B) Write the steps for solving an Assignment Problem by Hungarian method. **[04]**

OR

Q.5(A) Solve the following Assignment Problem: **[06]**

	EMPLOYEES				
		I	II	III	IV
JOB	A	22	30	21	15
	B	18	33	9	31
	C	44	25	24	21
	D	23	30	28	14

(B) Write an algorithm to perform LCM to obtain initial basic feasible solution for transportation problem. **[04]**

Q.6 In a machine shop 8 different products are being manufactured each requiring time on two different machines A and B are given in the table below: **[10]**

Product	1	2	3	4	5	6	7	8
Machine-A	30	45	15	20	80	120	65	10
Machine-B	20	30	50	35	35	40	50	20

Find an optimal sequence of processing of different product in order to minimize the total manufctured time for all product. Find total ideal time for two machines and elapsed time.

OR

Q.6 Find the critical path and calculate the Total float and Free float for the following PERT diagram. **[10]**