(27)

Roll No.: | | | | | | | | |

B.E/B.Tech. (FT) DEGREE END SEMESTER EXAMINATION NOV/DEC 2011

INDUSTRIAL ENGINEERING BRANCH

III SEMESTER

IE9202 – OPERATIONS RESEARCH – I

Answer All Questions

PART 'A' (10 x 2 = 20 Mark)

1. Name the conditions for standard form of LPP.
2. Under what conditions in the simplex table the solution is unbounded.
3. Write the primal dual relationships.
4. Write the differences between transportation and Assignment problem with respect to formulation.
5. What is pure integer and mixed integer programming problem?
6. Define fathomed.
7. What is tree? What is minimum spanning tree?
8. What is the use of dummy activity in the project management problem?
9. Define stage and state in the dynamic programming problem
10. Name some applications of dynamic programming problem

PART 'B' (5 x 16 = 80 Mark)

11. A call centre has the following minimal daily requirements for personnel as shown in the below table.

Time of day (24- hours clock)	**Period**	**Minimum number of people required**
2-6	1	20
6-10	2	15
10-14	3	8
14-18	4	6
18-22	5	12
22-24	6	30

Formulate a linear programming model to find an optimal schedule.

12 a) Solve the linear programming problem using simplex or dual simplex method

Minimize $Z = 4X_1 + 7X_2$
S.T
$2X_1 + 3X_2 \geq 5$
$X_1 + 7X_2 \geq 9$
$X_1, X_2 \geq 0$

OR

12 b) A canning company operates two canning plants. Three growers are willing to supply fresh fruits in the following amounts.

Smith 200 tons at Rs. 10/ ton
Jones 300 tons at Rs. 9/ton
Richard 400 tons at Rs. 8 / ton

Shipping cost in Rs. per ton are:

From	To	
	Plant A	**Plant B**
Smith	2	2.5
Jones	1	1.5
Richard	5	3

Plant capacities and labour costs are:

	Plant A	**Plant B**
Capacity	450 tons	550 tons
Labour cost	Rs25/ton	Rs 20/ton

The canned fruits are sold at Rs. 50/ ton to the distributors. The company can sell at this price all they can produce. How should the company plan its operations at the two plants so as to maximize its profits?

13 a) Solve the given Linear programming problem using branch and bound technique

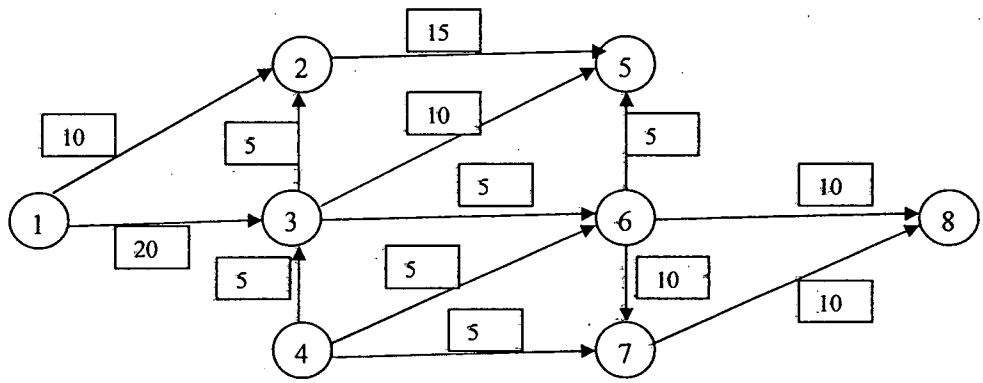
Maximize $Z = X_1 + X_2$
S.T
$7X_1 - 5X_2 \leq 7$
$-12X_1 + 15X_2 \leq 7$
X_1 X2 ≥ 0 and integer

OR

13b) Solve the given linear programming problem using Gomory's cutting plane method

Maximize $Z = X_1 + 2X_2$
ST
$2X_2 \leq 7$
$X_1 + X_2 \leq 7$
$2X_1 \leq 11$
$X_1, X_2 \geq 0$ and integer.

14 a) Compute the maximal flow from 1 to 8 in the following network.



OR

14 b) For a small project the crash and normal cost data are given below. Draw a network diagram and obtain the optimal crash given the indirect cost of Rs. 2000 per week.

Activity	Preceding activities	Normal time		Crash time	
		Time in weeks	*Cost in Rs.*	*Time in weeks*	*Cost in Rs.*
A	-	9	12,000	6	18,000
B	A	14	14,000	4	24,000
C	A	4	2000	3	2400
D	C	6	44,000	4	56,000
E	-	14	16,000	13	1800
F	E	6	4000	6	4000
G	B,D	5	4,000	3	4800
H	F,G	2	12,000	1	14,000

15 a) Let us consider an equipment that functions using four components connected in series. Each component has certain reliability and the reliability of the equipment is the product of the individual reliabilities. In order to increase the reliability of the equipment, we can have some additional component in standby. The reliabilities and cost for standby units for the four components are shown in the following table.

Number of units	Component A		Component B		Component C		Component D	
	Reliability	*Cost*	*Reliability*	*Cost*	*Reliability*	*Cost*	*Reliability*	*Cost*
1	0.6	6	0.4	10	0.7	5	0.5	8
2	0.75	11	0.65	14	0.9	10	0.6	13
3	0.85	15	0.8	17	0.95	14	0.8	16

We assume that Rs. 40 is available. How many units of each component (including the standby) should we have that maximizes the total reliability of the system?

OR

15 b) solve the linear programming problem using dynamic programming

Maximize $Z = 6X_1 + 5X_2$

S.T

$X_1 + X_2 \leq 5$

$3X_1 + 2X_2 \leq 12$

$X_1 , X_2 \geq 0$