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B.E. (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2013
INDUSTRIAL ENGINEERING
 Semester III
IE9202 OPERATIONS RESEARCH I
 (Regulation 2008)

3

Time: 3 Hours

Max. Marks 100

Answer all questions
Part A (10 X 2 = 20 Marks)

1. Differentiate between feasible solution and optimum solution.
2. What is degeneracy in simplex method ?
3. Define shadow price.
4. What is an unbalanced transportation problem?
5. What is the need for ILP?
6. State any two important assumptions of traveling sales man problem
7. Define total float.
8. Give any two applications of minimal spanning tree problem
9. What is a cut in flow network?
10. What is a stage wrt dynamic programming?

Part – B (5 x 16 = 80 Marks)

11. A company has two grades of inspectors 1 and 2 who are to be assigned to a quality inspection work. It is required that at least 1800 pieces are inspected per 8-hour day. Grade 1 inspectors can check pieces at the rate of 25 per hour with an accuracy of 98%. Grade 2 inspectors can check at the rate of 15 pieces per hour with an accuracy of 95%. The wage rate for grade 1 inspector is Rs 40 per hour while that of grade 2 is Rs 30 per hour. Each time an error is caused by the inspector the cost to the company is Rs 20. The company has available eight grade 1 and ten grade 2 inspectors. The company wants to determine the optimal assignment of inspectors to minimise total inspection cost. Formulate as LPP and solve using graphical method.
- 12 a. In a machine shop there are four machines and three jobs are to be processed.

Job	Machines			
	A	B	C	D
X	18	24	28	32
Y	8	13	17	19
Z	10	15	19	22

Each job can be assigned to one and only one machine. The cost of each job on each machine is given in the table. Determine the optimal assignment of jobs to machines that will minimize the total cost.

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12b. Solve the following transportation problem to minimise the total transportation cost.

	Project A	Project B	Project C	Capacity
Plant W	4	8	8	56
Plant X	16	24	16	82
Plant Y	8	16	24	77
Requirement	72	102	41	

13a. Solve the following ILP:

$$\begin{aligned} \text{Max } Z &= x_1 + x_2 \\ x_2 &\leq 2 \\ 3x_1 + 2x_2 &\leq 5 \\ x_1, x_2 &\geq 0 \text{ and integer} \end{aligned}$$

(OR)

13b. Write short notes on

- i) 0-1 programming
- ii) branch and bound method
- iii) goal programming

14a. The oil pipe line network and their capacities are given below. The arc represents the pipelines and the directions are as specified. S and D represent the source and sink respectively:

Arc	S-1	S-2	1-3	1-4	2-4	2-5	3-D	4-3	4-D	5-D
Capacity	22	30	10	20	15	15	18	5	10	20

What is the maximum amount of oil that can flow from the source to the sink?

(OR)

14 b. Implementation of new project requires the following activities. The details of activities in the project are as follows. Draw the network and find the project completion time and critical activities.

Activity	A	B	C	D	E	F	G	H	I	J	K
Duration(Weeks)	13	8	10	9	11	10	8	6	7	14	18
Imm. predecessor	-	A	B	C	B	E	D,F	E	H	G,I	J

15 a. The flowing table pertains to a road network covering cities 1,2.. 8. The time required to travel between a pair of cities is given in the table. Using dynamic programming determine the path that minimises the travel time between cities 1 and 8.

Cities	1-2	1-4	2-3	2-5	3-6	4-5	4-7	5-6	5-7	6-8	7-8
Time taken	1	3	2	3	3	2	3	2	2	3	3

(OR)

15 b Write Short notes on

- i) State diagram
- ii) Recursive equations
- iii) Bellman's principal of optimality