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

B.E/B.Tech END SEMESTER EXAMINATIONS April/May 2019

INDUSTRIAL ENGINEERING

Semester IV

IE8401 – OPERATIONS RESEARCH - I

(Regulation 2012)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. State the limitation of graphical method.
2. Define feasible region.
3. What is dual of dual?
4. Name different methods used to find the initial transportation cost
5. For what type of problem goal programming technique is used?
6. Define fathom in integer programming problem.
7. What is flow augmenting path?
8. In a network diagram, when we will use dummy activity?
9. What is forward recursive in dynamic programming problem?
10. State few applications where dynamic programming technique is used.

Part – B (5 x 16 = 80 marks)

11. a Solve the following LPP by the graphical method

Max $Z = 3X_1 + 2X_2$

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$-2X_1 + X_2 \leq 1$, $X_1 \leq 2$, $X_1+X_2 \leq 3$, $X_1, X_2 \geq 0$

12. a) Four different jobs can be done on four different machines. The matrix below gives the cost in Rupees of producing job i on machine j. Assign the jobs to the machines.

Jobs	Machine			
	M_1	M_2	M_3	M_4
J_1	5	7	11	6
J_2	8	5	9	6
J_3	4	7	10	7
J_4	10	4	8	3

(OR)

12 b) Find the optimal transportation cost for the following transportation table given below.

		A	B	C	D	E	Available
Factory	P	8	2	4	12	18	100
	Q	12	8	6	10	14	120
	R	10	4	12	8	16	120
	Demand	40	50	70	90	90	

13. a) Solve the given Linear programming problem using Gomory's cutting plane

Maximize $Z = X_1 + X_2$

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$7X_1 - 5X_2 \leq 7$

$-12X_1 + 15X_2 \leq 7$

$X_1, X2 \geq 0$ and integer

(OR)

b) Solve the given linear programming problem using method branch and bound technique

Maximize $Z = X_1 + 2X_2$

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$2X_2 \leq 7$

$X_1 + X_2 \leq 7$

$2X_1 \leq 11$

$X_1, X_2 \geq 0$ and integer

14. a) Consider the details of a distance network as shown below

Arc	Distance
1-2	8
1-3	5
1-4	7
1-5	16
2-3	15
2-6	3
2-7	4
3-4	5

Arc	Distance
3-6	6
4-5	8
4-6	12
5-8	7
6-8	9
6-9	15
7-9	12
8-9	6

a) Construct the distance network.

b) Find the shortest path from node 1 to node 9 using Floyd's algorithm.

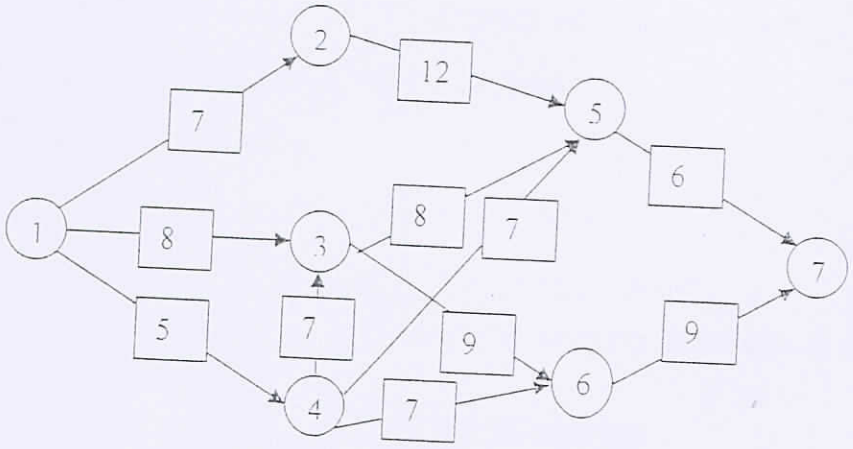
(OR)

b) Consider a project consisting of nine jobs with the following precedence relations and time estimates.

Job	Predecessor	Optimistic time	Most probable Time	Pessimistic time
A	-	2	5	8
B	A	6	9	12
C	A	6	7	8
D	B,C	1	4	7
E	A	8	8	8
F	D,E	5	14	17
G	C	3	12	21
H	F,G	3	6	9
I	H	5	8	11

a) Draw the project network for the above problem
b) Determine the expected duration, and variance of each job
c) What is the expected length of the project, and its variance?
d) Compute the probabilities for completing the project 3 days earlier than expected

15. a) In the given network you want find the shortest route between city 1 and city 7 using dynamic programming approach.



(OR)

b) Solve the given LPP using dynamic programming

Max $Z = 2X_1 + 5X_2$

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$2X_1 + X_2 \leq 43$

$2X_2 \leq 46$

$X_1, X_2 \geq 0$