

Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH(CHE) / SEM-8 / CHE-804B / 2012
2012
OPERATIONS RESEARCH

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Graph sheets(s) will be supplied by the Institute on demand.

GROUP – A

(Multiple Choice Type Questions)

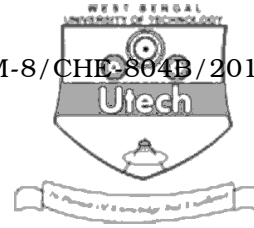
1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

 - i) The transportation problem deals with the transportation of
 - a) a single product from several sources to a destination
 - b) a multi-product from several sources to several destinations
 - c) a single product from several source to several destinations
 - d) a single product from a source to several destinations.
 - ii) In an assignment problem involving four workers and three jobs the total number of assignment possible is
 - a) 4
 - b) 3
 - c) 7
 - d) 12.



- iii) Floyd's algorithm is used to find out the shortest path between
- a) Any two nodes of the network
 - b) The sources node and any other nodes
 - c) Any node and destination node
 - d) Any pair of nodes of unidirectional network.
- iv) If the dual has an unbounded solution, then primal has
- a) An unbounded solution
 - b) An infeasible solution
 - c) A feasible solution
 - d) None of these.
- v) Dynamic problem deals with the
- a) Multi-stage decision making problems
 - b) Single stage decision making problems
 - c) Time dependent decision making problems
 - d) Problems which fix the levels of different decision variables so as to maximize profit or minimize the loss.
- vi) The solution of transportation problem with 6-source and 9-destination is feasible if the numbers of allocations are
- a) 14
 - b) 13
 - c) 54
 - d) 6 .
- vii) Which of the following is correct ?
- a) CPM is event oriented.
 - b) CPM is deterministic in nature.
 - c) Events marking the start of activities are called head events.
 - d) It is not possible for a network to have more than one critical path.



- viii) Which of the following is correct ?
- Dual of the Dual is Primal
 - Dual of the Primal is Primal.
- ix) Artificial variable need for
- Initial basic feasible solution
 - Initial non-basic feasible solution.
- x) To find the shortest path we use
- CPM
 - Floyd's algorithm.
- xi) Among the following which one is the better method ?
- North-West corner method
 - VAM method.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. A company makes two kinds of leather-belts A and B. Their respective unit profits are Rs. 4 and Rs. 3. One belt of type A requires 2 hours and type B requires 1 hour of time in making. The total man-hours available are 1000 per day. Due to insufficient supply of leather, the company can make only 800 belts per day. Only 400 buckles for type A and 700 buckles for type B are available. Formulate the problem as an L.P.P. and solve it graphically. 5
3. Find out the dual of the problem :
- Maximize, $Z_x = 2x_1 + 3x_2 - 4x_3$
- subject to $3x_1 + x_2 + x_3 \leq 2$
- $-4x_1 + 3x_3 \geq 4$
- $x_1 - 5x_2 + x_3 = 5$
- $x_1 \geq 0, x_2 \geq 0$ and x_3 , is unrestricted in sign. 5



4. Solve the following by graphical method :

$$\text{Max } Z = 5x + 8y$$

$$\text{subject to } 3x + 2y \leq 36$$

$$x + 2y \leq 20$$

$$3x + 4y \leq 42$$

$$x, y \geq 0$$

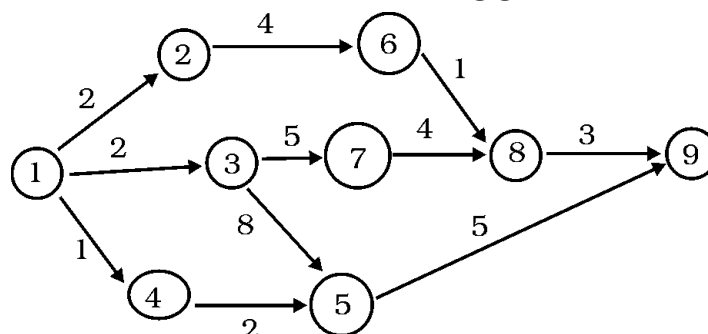
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5. Solve the following transportation problem :

5

	A	B	C	Available
I	6	8	4	14
II	4	9	8	12
III	1	2	6	5
Requirement	6	10	15	31

6. Find the critical path of the following graph.



GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following.

$$3 \times 15 = 45$$

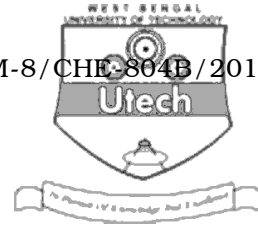
7. a) Solve the following L.P.P.

$$\text{Maximize } Z = 3x_1 + 2x_2$$

$$x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0$$



b) Find the dual of

$$\text{Minimize } Z = x_1 + x_2$$

$$\text{subject to } 2x_1 + x_2 \geq 8$$

$$3x_1 + 7x_2 \geq 21$$

$$x_1, x_2 \geq 0$$

also solve the dual using the Simplex method. 7 + 8

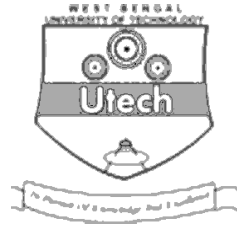
8. a) Solve the following Assignment problem :

	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>	<i>T</i>
<i>A</i>	13	8	16	18	19
<i>B</i>	9	15	24	9	12
<i>C</i>	12	9	4	4	4
<i>D</i>	6	12	10	8	13
<i>E</i>	15	17	18	12	20

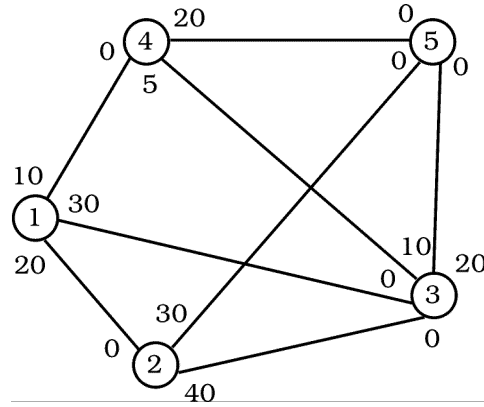
b) Solve the following transportation problem and check the optimality :

	<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>	Availability
<i>A</i>	22	46	16	40	8
<i>B</i>					
	42	15	50	18	8
<i>C</i>					
	82	32	48	60	6
<i>D</i>					
	40	40	36	83	3
Requirements	2	2	5	6	

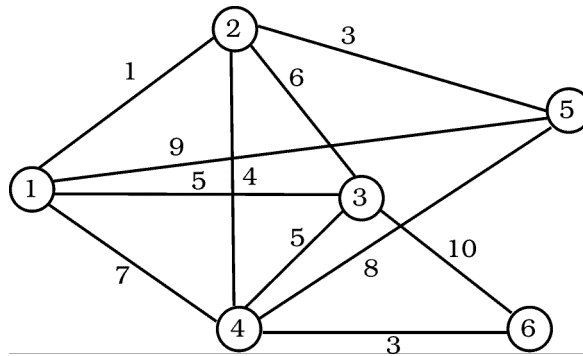
6 + 9



9. a) Find the maximum flow in the network

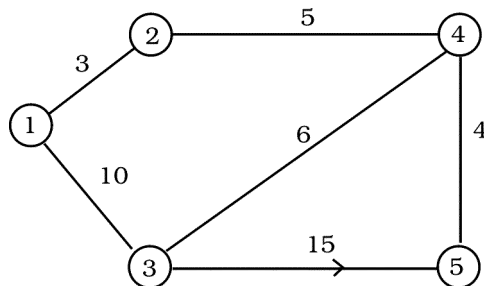


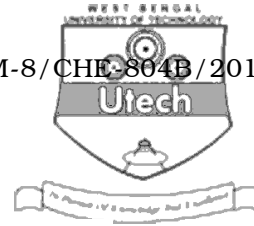
- b) Find the minimum spanning tree from the following graph.



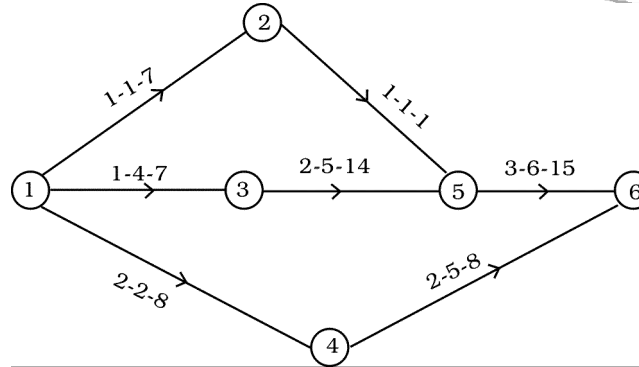
8 + 7

10. a) Find the shortest distance between node 1 to 5 by Dijkstra's algorithm.





b)



- (i) Determine the expected project length.
- (ii) Calculate the S.D. and the variance of the project length.
- (iii) What is the probability that the project will complete —
 - (x) at least 4 weeks earlier than expected time ?
 - (y) no more than 4 weeks later than expected time ?

Given that $\{ P(Z = 1.33) = 0.9082 \}$ 6 + 9

11. a) In a railway station the trains are arriving at a rate 30 trains per day. Assuming that the arrivals and service time satisfy exponential distribution where service time is 36 minutes. Find,
 - (i) the mean queuing length
 - (ii) the probability that queuing size exceeds 10.
 If the train increases to 33 per day then what will be the change in (i) and (ii) ?
- b) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that, when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for one year is Rs. 2 and set-up cost of a production run is Rs. 180. How frequently should production run be made ? 8 + 7