



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (CHE)/SEPARATE SUPPLE/SEM-8/CHE-804B/2011

2011

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 sheet (s) will be supplied by the Institution.

GROUP – A

(Multiple Choice Type Questions)

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

10 × 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 sources to several destinations
 - d) 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 are
 - a) 4
 - b) 3
 - c) 7
 - d) 12.



- ix) Artificial variable is needed for
 - a) initial basic feasible solution
 - b) initial non-basic feasible solution.
- x) To find the shortest path we use
 - a) CPM
 - b) Floyd's algorithm.
- xi) Among the following which one is the better method ?
 - a) North-west corner method
 - b) VAM method.

GROUP – B

(Short Answer Type Questions)

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

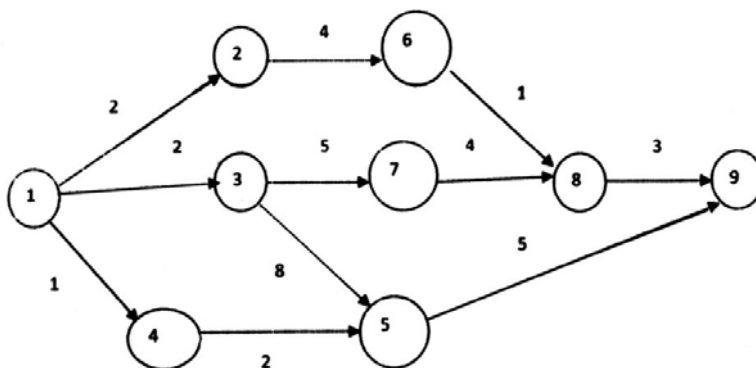
2. A company makes two kinds of leather-belts A and B. Their respective unit profits are Rs. 4 and Rs. 3. One belt of type A requires 2 hours and type B requires 1 hour of time in making. The total man-hours available are 1000 per day. Due to insufficient supply of leather, the company can make only 800 belts per day. Only 400 buckles for type A and 700 buckles for type B are available. Formulate the problem as a L.P.P. and solve it graphically.
3. Find out the dual of the problem
 Maximize, $Z = 2x_1 + 3x_2$
 subject to $3x_1 + x_2 \leq 2$
 $-4x_1 + 3x_2 \geq 4$
 $x_1 \geq 0, x_2 \geq 0$
4. Solve the following by graphical method
 Maximize $Z = 5x + 8y$
 subject to $3x + 2y \leq 36$
 $x + 2y \leq 20$
 $x, y \geq 0$



5. Solve the following transportation problem :

	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.

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

$$\text{subject to } x_1 + x_2 \leq 4$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0$$



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 problem.

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

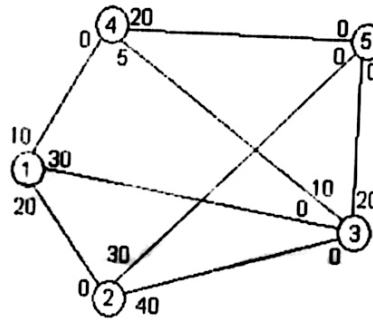
b) Solve the following transportation problem and check the optimality :

	<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	

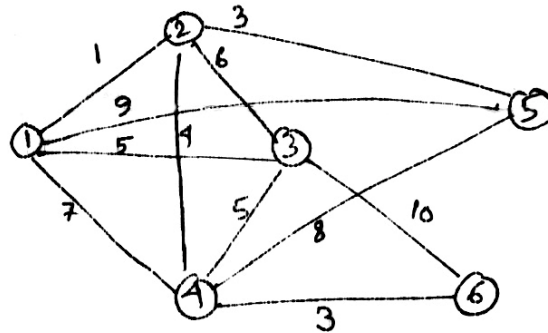
6 + 9



9. a) Find the maximum flow in the network

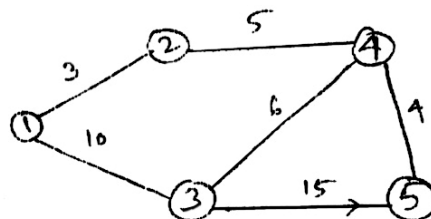


- b) Find the minimum spanning tree from the following graph :



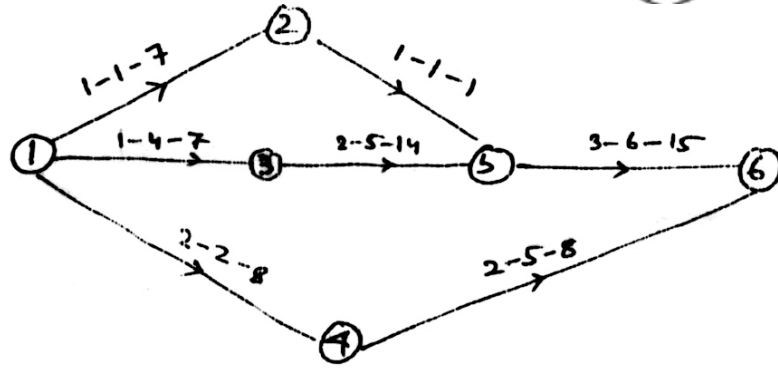
8 + 7

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





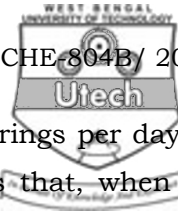
b)



- 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 be completed
 - a) at least 4 weeks earlier than expected time
 - b) 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
 - iii) 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 in Rs. 2 and setup cost of a production run is Rs. 180. How frequently should production run be made ? 8 + 7

=====