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(Following Paper ID and Roll No. to be filled in your
Answer Books)

Paper ID : 2012282   Roll No.

B.TECH.

Regular Theory Examination (Odd Sem - VII), 2016-17

OPERATION RESEARCH

Time : 3 Hours   *Max. Marks : 100*

Note : All questions are **compulsory**

SECTION - A

1. **Attempt all of the following :**   (10×2=20)

   a. Discuss the importance of operations research in decision making.

   b. Explain the terms : Optimistic time, pessimistic time, most likely time, free float and total float.

   c. Explain degeneracy in linear programming problem.

   d. Write the algorithm for finding minimum spanning tree for a network.

   e. What are the basic ideas involved in EOQ concept? Discuss.

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f. Explain the various costs associated with the maintaining inventory.

g. Explain shortest path model.

h. Define Minimax theorem.

i. What is single server model

j. What is transportation algorithm.

SECTION - B

2. **Attempt any five of the following :** (5×10=50)

a) The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients B1 and B2. B1 costs Rs. 5/kg and B2 costs Rs. 8/kg. Strength considerations dictate that the brick contains not more than 4 kg of B1 and a minimum of 2 kg of B2. Since the demand for the product is likely to be related to the price of the brick, find graphically the minimum cost of the brick satisfying the above conditions.

b) Solve by simplex method :

$Maximise$: $z = 2x + 5y$
$Subjected\ to$: $x + 4y \leq 24$
$$3x + y \leq 21$$
$$x + y \leq 9$$
$$x, y \geq 0$$

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c) Find the optimal cost of transportation.

	I	II	III	Availability
A	4	3	1	80
B	5	2	3	60
C	3	5	6	40
D	2	4	4	20
Requirement	60	60	30	

d) Consider the problem of assignment to assign five jobs to five m/cs. The assignment costs are given as follows :

	m/c I	m/c II	m/cIII	m/cIV	m/c V
J1	3	2	3	9	10
J2	11	5	9	10	2
J3	1	3	8	2	4
J4	8	11	10	5	2
J5	8	6	5	6	9

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e) There are five jobs, each of which is to be processed through three machines A, B and C in the order ABC. Processing times in hours are as follows :

Job	A	B	C
1	3	4	7
2	8	5	9
3	7	1	5
4	5	2	6
5	4	3	10

Determine the optimum sequence for the five jobs and the minimum elapsed time. Also find the idle time for the three machines and waiting time for the jobs.

f) The utility data for a network are given below. Determine the total, free, independent and interfacing floats and identify the critical path.

Activity:	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration:	2	8	10	6	3	3	7	5	2	8

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g) Find out value of game and optimum strategies whose payoff cost is give as follows :

Player B

	B1	B2	B3	B4	B5
A1	2	3	3	8	4
Player A A2	5	6	3	7	8
A3	6	7	9	8	7
A4	4	2	8	4	3

h) A self - service store employs one cashier at its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for the service time, find :

i) Average number of customers in the system.

ii) Average number of customers in the queue or average queue length.

iii) Average time a customer spends in the system.

iv) Average time a customer waits before being served.

SECTION - C

Note : Attempt any two of the following : (2×15=30)

3. Find optimum order quantity for a product for which the price - breaks are as follows :

Quantity (units)	Unit cost (Rs.)
Below 1000	10.00
$1000 \leq Q < 5000$	9.80
$Q \geq 5000$	9.50

The annual demand for a product is 64000 units. The ordering cost is Rs. 10 per order. The carrying cost per unit per year is 20%.

4. The purchase price of a machine is Rs. 52,000. The installation charges amount to Rs. 14400 and its scrap value is only Rs. 6400. The maintenance cost in various years is given below :

Year :	1	2	3	4	5	6	7	8
Maintenance cost :	1000	3000	4000	6000	8400	11600	16000	19200

After how many years should the machine be replaced? Assume that the machine replacement can be done only at the year ends.

5. Write a short notes on following :

i) CPM and PERT

ii) Sensitivity analysis in LPP

iii) Maximal flow problem

iv) Phases of project management