PAPER ID-310511

Roll No: | | | | | | | | | | | | | |

B TECH
(SEM-VII) THEORY EXAMINATION 2020-21
OPERATION RESEARCH

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	What are slack and surplus variables?
b.	What is linear programming?
c.	What are the different costs that are involved in the inventory problem?
d.	What are the basic characteristics of a queuing system?
e.	What are the assumptions made in the theory of games?
f.	Differentiate between individual and group replacement.
g.	What are the advantages and limitations of LP problem?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a.	Explain the scope of OR.
b.	The demand of an item is uniform, at a rate of 25 unit per month. The fixed cost is Rs.15 each time a production run is made. The production cost is Rs.1 per item and the inventory carrying cost is Rs.0.30 per item per month. If the shortage cost is Rs.1.50 per item per month, determine the frequency and size of the production run that is to be made.
c.	Calculate the earliest start, earliest finish, latest start, and latest finish of each activity of the project given below:

activity	1-2	1-3	1-5	2-3	2-4	3-4	3-5	3-6	4-6	5-6
Duration (week)	8	7	12	4	10	3	5	10	7	7

d.	Explain the replacement of items that deteriorate with time under the value of money doesn't change with time and change with time.
e.	Write notes on augmenting path algorithm.

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) Solve using Vogel's Approximation Method and perform optimality Test using MODI method:

	D1	D2	D3	D4	Supply
O1	2	3	11	7	6
O2	1	0	6	1	1
O3	5	8	15	9	10
Demand	7	5	3	2	17

(b) A barber shop has space to accommodate only 10 customers. He can serve only one person at a time. If a customer comes to his shop and finds it full, he goes to the next shop. Customers randomly arrive at an average rate $\lambda=10$ per hour and the berbe's service time is negative exponential with an average of $1/\mu = 5$ minutes per customer. Find P_o and P_n.

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Obtain the optimal strategies for both persons and the value of the game for zero-sum two-person game whose payoff matrix is given below:

3	2	4	0
2	4	4	2
4	2	4	0
0	4	0	8

(b) Determine an initial basic feasible solution and optimal solution to the transportation problem given in table:

		To				Supply
		I	II	III	IV	
From	A	13	11	15	20	2000
	B	17	14	12	13	6000
	B	18	18	15	14	7000
Demand		3000	3000	4000	5000	

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) There are five jobs, each of which must go through the two machines A and B in the order AB. Processing times are given below.

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

Determine a sequence for the five jobs that will minimize the total elapsed time.

(b) A supermarket has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean four minutes and if people arrive in a Poison fashion at the counter, at the rate of 10 per hour, then calculate, i) the probability of having to wait for service. ii) the expected percentage of idle time for each girl. iii) if a customer has to wait, find the expected length of his waiting time.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Explain the steps in PERT method and write the formula in calculating project variance and estimated time.

(b) A manufacturer is offered two machines A and B. A is priced at Rs.50,000 and running costs are estimated at Rs.8000 for each of the first five years, increasing by 2000 per year in the sixth and subsequent years. Machine B of the same capacity costs Rs. Rs.25,000 but will have running costs of Rs.12000 per year for six years increasing by Rs.2000 per year thereafter. If money is worth 10% per year, which machine should be purchased?

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) A paper mill produces 2 grades of paper namely x and y. Because of raw material restrictions, it cannot produce more than 400 tons of grade x and 300 tons of grade y in a week. There are 160 production hours in a week. It requires 0.2 hours and 1.4 hours to produce a tone of product x and y respectively, with corresponding profits of Rs.200 and Rs.500 per ton. Formulate the above LPP to maximize the profit using the graphical method.

(b) Solve by using simplex method, Maximize Z= Max $Z=4X_1+10X_2$ Subject to $2X_1+X_2\leq 10$ $2X_1+5X_2\leq 20$
$2X_1+3X_2\leq 18$
$X_1, X_2\geq 0$