

B.TECH. SEM -VII PRODUCTION 2014 COURSE (CBCS) :
SUMMER - 2018
SUBJECT: OPERATIONS RESEARCH

Day: **Monday**
Date: **21/05/2018**

S-2018-2523

Time: **02.30 PM TO 05.30 PM**
Max Marks: 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Assume suitable data, if necessary.
- 4) Use of non programmable **CALCULATOR** is allowed.

Q.1 a) Define Operation Research. State the objectives and scope of Operation Research. **(05)**

b) Solve the following LPP by graphical method, **(05)**

Maximize $z = 120x_1 + 100x_2$

Subject to the constraints :

$$10x_1 + 5x_2 \leq 80$$

$$6x_1 + 6x_2 \leq 66$$

$$4x_1 + 8x_2 \geq 24$$

$$5x_1 + 6x_2 \leq 90$$

$$x_1, x_2 \geq 0$$

OR

Solve the following problem by simplex method : **(10)**

Maximize

$Z = 5x_1 + 3x_2$, subject to

$$3x_1 + 5x_2 \leq 15$$

$$5x_1 + 2x_2 \leq 10$$

$$x_1, x_2 \geq 0$$

Q.2 a) Explain the term restrictions on assignments. **(04)**

b) A marketing manager has 5 salesman and 5 sales districts. Considering the capabilities of the salesman and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows : **(06)**

	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

Find the assignment of salesman to districts that will result in a maximum sale.

P.T.O.

OR

Find initial solution by lowest cost entry method, then prove optimum (10)

		To			Supply
		A	B	C	
From	1	10	9	8	8
	2	10	7	10	7
	3	11	9	7	9
	4	12	14	10	4
Demand		10	10	8	

Q.3 a) What do you understand by inventory? Discuss various costs associated with inventory. (05)

b) The demand of an item is uniform at a rate of 25 units per month. The fixed cost is Rs.15 each time a production run is made. The production cost is Re 1 per item, and the inventory carrying cost is Re 0.30 per item per month. If the shortage cost is Rs.1.50 per item, per month determine how often should a production run be made and of what size should it be? (05)

OR

a) What is selective inventory control? Explain the VED model of selective inventory control. (05)

b) The annual demand of a product is 10,000 units. Each unit costs Rs.100 if the orders are placed in quantities below 200 units. For orders of 200 or above, however, the price is Rs.95. The annual inventory holding costs is 10 per cent of the value of the item and the ordering cost is Rs.5 per order. Find the economic lot size. (05)

Q.4 a) Explain the method of processing of n jobs on 3 machines. (04)

b) The TAJ service station has a central store where service mechanics arrive to take the spare parts for the jobs they work upon. The mechanics wait in the queue if necessary and are served on First-come-first-served basis. The store is manned by one attendant who can attend 8 mechanics per hour on an average. The arrival rate of the mechanics averages 6 per hour. Assuming that the pattern of mechanics arrival is poisson distributed and the servicing time is exponentially distributed. Determine,
1) Average utilization
2) Expected time spent by mechanic in the system.
3) Expected time spent by mechanic in the queue.
4) Expected number of mechanics in the queue. (06)

OR

a) Explain the service mechanism of any queuing process. (04)

b) Determine the optimal sequence of the jobs that minimize the total elapsed time based on the following information. Processing time on machines is given in Hrs. (06)

Job	A	B	C	D	E	F	G
M1	3	8	7	4	9	8	7
M2	4	3	2	5	1	4	3
M3	6	7	5	11	5	6	12

Q.5 a) What is Two Person Zero Sum Game? (03)

b) The data on the operating cost per year and the resale price of the equipment A whose price is Rs. 10, 000 are given below. (07)

Year	1	2	3	4	5	6	7
Operating cost	1500	1990	2300	2900	3600	4500	5500
Resale value	5000	2500	1250	600	400	400	400

What is the optimum period for replacements?

OR

a) Explain the concept of Individual and group replacement policy. (03)

b) Consider the game with following payoff matrix. (07)

	Player B	
Player A	B ₁	B ₂
A ₁	2	6
A ₂	-2	λ

- 1) Show that the game is strictly determinable whatever λ may be.
- 2) Determine the value of Game.

Q.6 A company manufacturing plant and equipment for chemical processing is in the process of quoting a tender called by a public sector undertaking. The delivery data, once promised, is crucial and a penalty clause is applicable. The project manager has listed down the activities in the project as under : (10)

Activity	Immediate Predecessor	Activity Time (Weeks)		
		Optimistic	Most Likely	Pessimistic
A	-	1	3	5
B	-	2	4	6
C	A	3	5	7
D	A	5	6	7
E	C	5	7	9
F	D	6	8	10
G	B	7	9	11
H	E, F, G	2	3	4

- a) Find out the delivery week from the date of commencement of the project, and
- b) Find the total float and free float for each of the non critical activities.

OR

The three time estimates of a project are given below : (10)

Activity	Estimated Duration (Weeks)		
	t_o	t_m	t_p
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	1	6	15

- 1) Find the expected duration and variance of each activity.
- 2) Calculate early and late occurrences time of each node.
- 3) Calculate the variance and standard deviation of the project length.
- 4) What is the probability that the project will be completed
 - i) At least 4 weeks earlier than the expected time.
 - ii) No more than 4 weeks later than expected time.