



**M.Com. II Semester (CBCS) Degree Examination,  
September/October - 2022**

**COMMERCE**

**21COM2C7L : Operations Research for Business Decisions**

Time : 3 Hours

Maximum Marks : 70

**Note :** Answer **any five** of the following questions with Question No.1 is **Compulsory**. Each question carries **equal** marks.

1. (a) What is Operations Research ? Make a brief note on techniques of OR. **7**  
 (b) Solve the following LPP under Graphical Method. **7**  
 Maximise 'Z' =  $8x_1 + 5x_2$   
 Subject to constraints  
 $x_1 \leq 150$ ,  
 $x_2 \leq 250$ ,  
 $2x_1 + x_2 \leq 500$ ,  
 $x_1, x_2 \geq 0$  (Non-Negativity Constraints)
2. (a) What is degeneracy ? Explain the process of degeneracy with an illustration. **7**  
 (b) Solve the following LPP under Simplex method. **7**  
 Minimize  $Z = -X_1 - 3X_2 + 2X_3$   
 Subject to constraints  
 $3X_1 - X_2 + 3X_3 \leq 7$   
 $-2X_1 + 4X_2 \leq 12$   
 $-4X_1 + 3X_2 + 8X_3 \leq 10$   
 Where,  $X_1, X_2, X_3 \geq 0$
3. A company has 3 factories A, B and C which supply to 5 warehouses its small car fans. The production capacity of factories and the demand of customers - assumed constant and distribution costs are given in the following table. **14**

Wholesalers	A	B	C	D	E	Available Units	
Factories	F1	5	7	10	5	3	5
	F2	8	6	9	12	4	10
	F3	10	9	8	10	15	10
Requirement		3	3	10	5	4	25

The objective is to supply the wholesalers with their demand in a cheapest way.  
 Use -

- (i) North-West Corner Rule.  
 (ii) Minimum Entry Cell Method.  
 (iii) VAM for optimal solution.



4. (a) A truck owner finds from his past record that maintenance cost per year of a truck whose purchase price is Rs. 8,000 are as given below : 4

Year	1	2	3	4	5	6	7	8
<b>Maintenance cost (Rs.)</b>	1,000	1,300	1,700	2,200	2,900	3,800	4,800	6,000
<b>Resale price (Rs.)</b>	4,000	2,000	1,200	600	500	400	400	400

Determine at what time it is profitable to replace the truck.

- (b) The following failure rates have been observed for a special type of light bulbs. 10

Months	1	2	3	4	5
<b>% Failing at the end of each month</b>	10	25	50	80	100

In an industrial unit there are 1,000 special type of bulbs in use, and it costs Rs. 10 to replace an individual bulb which has burnt out. If all bulbs are replaced simultaneously, it would cost Rs. 2.50 per bulb. It is proposed to replace all bulbs at fixed intervals, whether or not they have burnt out and to continue replacing burnt out bulbs as they fail. At what intervals of time the manager should replace all the bulbs.

5. The scheduled completion time of a project is 48 days. Calculate probability of finishing the project within this time. 14

Activity	To	Tm	Tp
10-20	4	8	12
20-30	1	4	7
30-50	3	5	7
20-40	8	12	16
40-50	0	0	0
40-60	3	6	9
50-70	3	6	9
50-80	4	6	8
60-100	4	6	8
70-90	4	8	12
80-90	2	5	8
90-100	4	10	16

- (i) Draw a PERT network.
- (ii) Find the critical path.
- (iii) Find the starting and ending time estimates.
- (iv) Find early and late start, early and late finish.
- (v) What is the probability of completing the project in 48 days for the critical path ?
- (vi) What due date 95% chance of being met ?



6. (a) Discuss the steps used in solving the LP problem under simplex method. 7  
 (b) Explain the various methods of obtaining initial basic feasible solution under transportation model. 7
7. (a) Write a short note on Group Replacement ? 4  
 (b) A project has the following characteristics. Construct PERT network and find critical path. 10

Activity	To	Tm	Tp
1-2(A)	1	5	1.5
2-3(B)	1	3	2
2-4(C)	1	5	3
3-5(D)	3	5	4
4-5(E)	2	4	3
4-6(F)	3	7	5
5-7(G)	4	6	5
6-7(H)	6	8	7
7-8(I)	2	6	4
7-9(J)	5	6	8
8-10(K)	1	3	2
9-10(L)	3	7	5

8. (a) A company has 4 machines to do 3 jobs. Each job can be assigned to 1 & only 1 machine. The cost of each job on a machine is given to the following table :

Machines		W	X	Y	Z
Jobs	A	18	24	28	32
	B	8	13	17	18
	C	10	15	19	22

- What are the job assignments which will minimize the cost ? 5  
 (b) Discuss the rules for constructing the network diagram with an illustration. 5  
 (c) What are the Common Errors in PERT network ? 4

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