

B.Com 5th Sem. (Old Sylb 2017) (Special Chance)**(2221)****Paper: BCG-505 Operations Research****Time Allowed: 3hrs.****Max. Marks: 50****Section-A****Note:** Attempt any ten questions. All questions carry one mark.

1. (a) Write features of Operations Research.
- (b) Write general LLP model.
- (c) Write limitations of Game Theory.
- (d) Differentiate between Float and Slack.
- (e) Discuss characteristics of Queuing theory.
- (f) Define two person zero sum game.
- (g) What do you understand by travelling salesman problem?
- (h) Explain the term "Crashing in Network analysis".
- (i) Explain steps of graphical method of solving LPP.
- (j) What do you mean by $2 \times n$ games?
- (k) Define term degeneracy.
- (l) Explain Prohibited Assignment.

Section-B**Note:** Attempt any two questions. Each question carries ten marks.

2. Explain Operational Research. Discuss its scope and necessity in current business environment.
3. Five Jobs are to be assigned to five people; each person will do one job only. The expected times (in hours) required for each person to complete each job have been estimated are shown in the following table. Use the Hungarian Method to determine the optimal assignments.

Job	Person				
	1	2	3	4	5
I	12	15	13	14	15
II	16	18	15	14	16
III	18	16	15	18	20
IV	15	20	18	17	19
V	16	15	18	14	15

4. The standard weight of a special purpose brick is 5 kg and it contains two basic ingredients B_1 and B_2 . B_1 costs ₹5/kg and B_2 costs ₹ 8/ kg. Strength considerations dictate that the brick contains not more than ₹4 kg of B_1 and a minimum of 2 kg of B_2 . Since the demand for the product is likely to be related to the price of the brick, find the minimum cost of the brick satisfying the above conditions.

5. The relevant data on demand supply and profit per unit of a product manufactured and sold by a company are given below:

Factory	Outlets					Supply
	A	B	C	D	E	
F ₁	5	8	14	7	8	100
F ₂	2	6	7	8	7	20
F ₃	3	4	5	9	8	60
F ₄	4	10	7	8	6	20
Demand	45	65	70	35	15	

Given that transportation from F₁ to C and F₄ to B are not allowed due to certain reasons. Solve the transportation problem for optimality.

Section-C

Note: Attempt any two questions. Each question carries ten marks.

6. (a) "A Game refers to a situation of business conflict." Comment on the situation.
 (b) Differentiate PERT and CPM. How costs are calculated in both? (5,5)
7. Arrival rate of telephone calls at a telephone booth are according to Poisson distribution, with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed, with mean 3 minutes.
- Determine the probability that a person arriving at the booth will have to wait.
 - Find the average queue length that is formed from time to time.
 - The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for the phone. Find the increase in flow rate of arrivals which will justify a second booth
 - What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free?
 - What is the probability that he will have to wait for more than 10 minutes before the phone is available and the call is also complete?
 - Find the fraction of a day that the phone will be in use.
8. Find the optimal strategies for A and B in the following game. Also obtain the value of the game

A's Strategy	B's Strategy			
		b ₁	b ₂	b ₃
a ₁		9	8	-7
a ₂		3	-6	4
a ₃		6	7	-7

9. The data for a project are:

Activity	Preceding Activity	Time (in weeks)		Cost (in ₹)	
		Normal	Crash	Normal	Crash
A	None	3	2	18000	19000
B	None	8	6	600	1000
C	B	6	4	10000	12000
D	B	5	2	4000	10000
E	A	13	10	3000	9000
F	A	4	4	15000	15000
G	F	2	1	1200	1400
H	C,E,G	6	4	3500	4500
I	F	2	1	7000	8000

- (i) Draw a project network diagram and find the critical path.
- (ii) If a deadline of 17 weeks is imposed for completion of the project, what activities will be crashed, what would be the additional cost and what would be the critical activities of the network after crashing?