(i) **Printed Pages: 4** **Roll No. .....**

(ii) **Questions : 14** **Sub. Code : 0839**

Exam. Code : 0016

Bachelor of Commerce 6th Semester

1059

OPERATIONAL RESEARCH

Paper—BCM-605

Time Allowed : Three Hours] **[Maximum Marks : 80**

Note :— Attempt **four** questions from Section-A and **two** questions each from Section-B and Section-C. Use of non-programmable calculator is allowed.

SECTION—A (4×5)

1. Differentiate between slack variable and surplus variable.
2. Explain minimum regret method with example.
3. Write the dual of the given problem :

   Min $Z = 2X_2 + 5X_3$

   subject to :

   $X_1 + X_2 \geq 2$

   $2X_1 + X_2 + 6X_3 \leq 6$

   $X_1 - X_2 + 3X_3 = 4$

   $X_1, X_2, X_3 \geq 0$

4. Luminous lamps has three factories — F1, F2 and F3. The manufactured units are to be shipped to four warehouses W1, W2, W3 and W4. The transportation costs (in Rs.) per unit between factories and warehouses are given below :

Factory	Warehouse				Supply
	W_1	W_2	W_3	W_4	
F_1	1	2	1	4	30
F_2	3	3	2	1	50
F_3	4	2	5	9	20
Demand	20	40	30	10	

Find an initial basic feasible solution of the given transportation problem using northwest corner rule.

5. Rizwana is a writer of fantasy novels. A movie company and a TV network both want exclusive rights to one of her more popular works. If she signs with the network, she will receive a single lump sum payment of Rs. 9 lakh, but if she signs with the movie company, the amount she will receive depends on the market response to her movie as below :

Response	Probability	Payout (Rs.)
Poor	0.3	2,00,000
Good	0.6	8,00,000
Excellent	0.1	30,00,000

What should she do ?

6. Find the value of game for the following matrix :

		Player-B	
		B_1	B_2
Player - A	A_1	−5	0
	A_2	8	−1

SECTION—B (2×15)

7. Explain in detail the role of OR in solving industrial problems with suitable examples.

8. Explain the following in detail with suitable illustrations :
   (a) Unbalanced Transportation Problem
   (b) Degenerate Transportation Problem.

9. Solve the following linear programming problem :
   Minimize $Z = 5X_1 - 6X_2 - 7X_3$
   subject to constraints :
   $X_1 + 5X_2 - 3X_3 \geq 15$
   $5X_1 - 6X_2 + 10X_3 \leq 20$
   $X_1 + X_2 + X_3 = 5$
   X_1, X_2 and $X_3 \geq 0$

10. At the head office of Chandan, there are five registration counters. Five persons are available for service. Profit of persons under different counters are as below :

Counter	Person				
	A	B	C	D	E
1	30	37	40	28	40
2	40	24	27	21	36
3	40	32	33	30	35
4	25	38	40	36	36
5	29	62	41	34	39

How should the counters be assigned to persons so as to maximize the profit ?

SECTION—C (2×15)

11. Explain maximax, maximin and minimax under decision theory with examples.

12. *"Game theory is the mathematical study of situations of conflict of interest."* In the light of this statement, explain the meaning and applications of game theory in managerial decisions.

13. A factory has 1000 bulbs installed. Cost of individual replacement is Rs. 3 while that of group replacement Re. 1 per bulb respectively. It is decided to replace all the bulbs simultaneously at fixed interval and also to replace the individual bulbs that fail in between. Determine optimal replacement policy. Failure probabilities are as given below :

Week	1	2	3	4	5
Failure Probability	0.10	0.25	0.50	0.70	1.00

14. The Janta Bakery Shop keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given below :

Daily Demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Consider the following sequence of random numbers : 21, 27, 47, 54, 60, 39, 43, 91, 25 and 20. Using this sequence, simulate the demand for the next 10 days. Find out the stock situation, if the owner of the bakery shop decides to make 30 cakes every day. Also estimate the daily average demand for the cakes on the basis of simulated data.