(i) **Printed Pages: 4**

Roll No. ....

(ii) **Questions** : 14

Sub. Code : | 0 | 8 | 3 | 9 |

Exam. Code : | 0 | 0 | 1 | 6 |

Bachelor of Commerce 6th Semester
(2054)
OPERATIONAL RESEARCH
Paper : BCM-605

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

Note :—Attempt **FOUR** short answer type questions from Section A. Attempt **TWO** questions each from Sections B and C respectively.

SECTION—A

1. Max. $Z = 30x_1 + 20x_2$

    Sub to Constraints : $-x_1 - x_2 \geq -8$

    $$-6x_1 - 4x_2 \leq -12$$
    $$5x_1 + 8x_2 = 20$$

    Where $x_1, x_2 \geq 0$

    Make the dual of the above.

2. The manager of an Oil Refinery must decide on the optimal mix of 2 possible blending processes of which the inputs and outputs per production run are as follows :

	Input		Output	
Process	Crude A	Crude B	Gasoline X	Gasoline Y
1	6	3	6	9
2	5	6	5	5

The maximum availability of Crude A and B are 250 units and 200 units respectively. The market requirements shows that atleast 150 units of Gasoline X and 130 units of Gasoline Y must be produced. The profit per production run from process 1 and 2 are Rs. 40 and Rs. 50 respectively. Formulate the problem.

3. In a game of matching coins with 2 players. Suppose A wins one unit of value when there are 2 heads, wins nothing when there are two tails and loses ½ units of value when there are one head & one tail. Determine value of game and probabilities.

4. Max. $Z = 5x_1 + 4x_2$

   Subject to $2x_1 - 4x_2 \leq 1$

   $$2x_1 + 4x_2 \geq 2$$

   Solve the LPP Graphically.

5. Individual Replacement *vs.* Group Replacement.

6. What do you understand by Decision Tree Analysis ? 4×5

SECTION—B

7. What are the important techniques used in Operations Research ? Give limitations of Operations Research.

8. Max. $Z = 2x_1 + 3x_2 + 4x_3$

   Subject to $3x_1 + x_2 + 4x_3 \leq 600$

   $$2x_1 + 4x_2 + 2x_3 \geq 480$$

   $$2x_1 + 3x_2 + 3x_3 = 540$$

   Whereas $x_1, x_2, x_3 \geq 0$

9. Solve the following salesman problem given by the following data $C_{12} = 20$, $C_{13} = 4$, $C_{14} = 10$, $C_{23} = 5$, $C_{34} = 6$, $C_{25} = 10$, $C_{35} = 6$, $C_{45} = 20$. Where $Cij = Cji$ and there is not route between cities i & j if a value of Cij is not known.

10. A manufacturer has distribution centres located at Agra, Allahabad and Kolkata. These centres have available 40, 20 and 40 units of his produce. His retail outlets require the following number of units : A-25; B-10; C-20; D-30; E-15. The shipping cost per unit in rupees between each centre and outlet is given in the following table :

Distribution Centres	Retail Outlets				
	A	B	C	D	E
Agra	55	30	40	50	40
Allahabad	35	30	100	45	60
Kolkata	40	60	95	35	30

Determine the optimal Shipping Cost.   2×15

SECTION—C

11. Solve the game by using principle of Dominance :

PLAYER B

	I	II	III	IV	V	VI
PLAYER A	4	2	0	2	1	1
	4	3	1	3	2	2
	4	3	7	−5	1	2
	4	3	4	−1	2	2
	4	3	2	−2	2	2

12. Following mortality rates have been observed for a certain type of fuses :

Week	1	2	3	4	5
% failing by the end of week	5	15	35	75	100

There are 1000 fuses in use and it costs Rs. 5 to replace one individual fuse. If all fuses were replaced simultaneously, it would cost Rs. 1.25 per fuse. At what intervals the group replacement should be done ? Which policy is better ?

13. Gupta Bakery Amritsar keeps stock of a popular brand of cake. Daily demand based on past experience is as follows :

Daily Demand	0	15	25	35	45	50
Probability	.01	.15	.20	.50	.12	.02

Consider the following sequence of random numbers :

48, 78, 09, 51, 56, 77, 15, 14, 68, 09

Using the sequence, simulate the demand for the next 10 days.

Find out the stock situation if the owner of the bakery decides to make 35 cakes every day. Also estimate the daily average demand for the cake on the basis of simulated data.

14. Give the role of Queuing Theory in Decision making and discuss its application. 2×15