(i) Printed Pages : 7 Roll No. .....

(ii) Questions : 14 Sub. Code : 0 8 3 9

Exam. Code : 0 0 1 6

Bachelor of Commerce 6th Semester

(2053)

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. Each question in Section A carries 5 marks. Each question in Section B & Section C carries 15 marks.

SECTION—A

1. Differentiate between slack variable and surplus variable.

2. Difference between pure strategy and mixed strategy.

3. Write the dual of the following Primal LP problem :

Maximize $Z = 3x_1 + 5x_2 + 7x_3$

subject to

$$x_1 + x_2 + 3x_3 \leq 10$$

$$4x_1 - x_2 + 2x_3 \geq 15$$

$$x_1 + x_2 + x_3 = 20$$

$x_1, x_2 \leq 0$, x_3 is unrestricted.

4. Solve graphically the following LPP :

Min $Z = 3x_1 + 5x_2$

subject to

$$-3x_1 + 4x_2 \leq 12$$

$$2x_1 - x_2 \geq -2$$

$$2x_1 + 3x_2 \geq 12$$

$$x_1 \leq 4$$

$$x_2 \geq 2$$

where, $x_1, x_2 \geq 0$.

5. The data collected in running a machine, the cost of which is Rs. 60,000 are given below :

Years	1	2	3	4	5
Resale Value (Rs.)	42,000	30,000	20,400	14,400	9,650
Cost of Spares (Rs.)	4,000	4,270	4,880	8,700	6,800
Cost of Labour (Rs.)	14,000	16,000	18,000	21,000	25,000

Determine the optimum period for replacement of the machine.

6. Pay-off of the three courses of actions A_1, A_2 and A_3 and States of Nature (Events) N_1, N_2 and N_3 are given as below :

States of Nature (Events)	Courses of Action		
	A_1	A_2	A_3
N_1	35	–20	–105
N_2	450	320	380
N_3	550	700	725

The probabilities of the State of nature are respectively 0.2, 0.6 and 0.2. Calculate and tabulate EMV and find which is the best act to be chosen. 4×5

SECTION—B

7. Define Operation Research. Discuss the role of operation research in solving complex business problems with suitable examples.

8. Use simplex to solve :

Max $Z = 15x_1 + 25x_2$

subject to

$$7x_1 + 6x_2 \geq 20$$

$$8x_1 + 5x_2 \leq 30$$

$$3x_1 - 2x_2 = 1.8$$

where, $x_1, x_2 \geq 0$.

9. A company has three factories and four customers. The company furnishes the following schedule of profit per unit on transportation of its goods to the customers in rupees :

Customers

Factory	A	B	C	D	Supply
P	40	25	22	33	100
Q	44	35	30	30	30
R	38	38	28	30	70
Demand	40	20	60	30	

You are required to solve the transportation problem to maximize the profit and determine the resultant optimal profit.

10. Solve the assignment problems represented by the following effective matrix :

	I	II	III	IV	V	VI
A	71	89	85	80	76	78
B	79	83	67	74	72	83
C	73	70	81	82	76	89
D	91	94	84	89	81	80
E	88	89	77	87	67	74

2×15

SECTION—C

11. What do you mean by simulation ? Describe the simulation process. What are the advantages and limitations of simulation ? Also, specify the areas where simulations can be used with suitable examples.

12. Solve the following by Algebric method :

		B		
		B_1	B_2	B_3
A	A_1	−1	2	1
	A_2	1	−2	2
	A_3	3	4	−3

13. The following failure rates have been observed for a certain type of transistors in a digital computer :

End of Week	Probability of failure
1	0.05
2	0.13
3	0.25
4	0.43
5	0.68
6	0.88
7	0.96
8	1.00

The cost of replacing an individual failed transistor is Rs. 1.25. The decision is made to replace all these transistors simultaneously at fixed intervals and to replace the individual transistors as they fail in service. If the cost of group replacement is 30 paise per transistor, what is the best interval between group replacements ? At what group replacement price per transistor would a policy of strictly individual replacement become preferable to the adopted policy ?

14. Find the value of game :

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	3	2	4	0
	A_2	3	4	2	4
	A_3	4	2	4	0
	A_4	0	4	0	8

2×15