E 7332 (Pages : 4) Reg. No.....

Name.....

B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2014

Fourth Semester

Complementary Course—OPERATIONAL RESEARCH

Time : Three Hours Maximum Weight : 25

Part A

Answer **all** *questions.*
A bunch of 4 *questions has weight* 1.

I. 1. It is believed O.R. came into existence during a major development in History. Name that development.

2. Give an example of an Iconic model.

3. What are Analogue models ?

4. What is stochastic model ?

II. 5. What is a basic feasible solution ?

6. Is it necessary that feasible region should always be a convex set.

7. What is an optimal solution of a L.P.P. ?

8. Define a Convex set.

III. 9. What is a balanced transportation problem ?

10. With reference to a transportation problem, define degenerate basic feasible solution.

11. Define Loop in a transportation problem.

12. What is an assignment problem ?

IV. 13. Is it necessary that a game should always possess a saddle point.

14. Define the term pay-off matrix.

15. Show that the game with the following pay-off matrix is strictly determinable.

		Player B	
		B_1	B_2
Player A	A_1	2	6
	A_2	−2	λ

16. State the fundamental theorem of rectangular game.

(4 × 1 = 4)

Turn over

Part B

Answer any **five** *questions.*
Each question has weight 1.

17. What are the areas of applications of O.R. ?
18. What are the advantages of O.R. models ?
19. What are the basic assumptions of a Linear Programming model ?
20. Explain the north west corner method for obtaining an initial basic feasible solution of a transportation problem.
21. Give the mathematical formulation of an assignment problem.
22. Explain the difference between pure and mixed strategies.
23. Define iso-profit and iso-cost lines.
24. Define Competitive game.

(5 × 1 = 5)

Part C

Answer any **four** *questions.*
Each question has weight 2.

25. A manufacturing company is engaged in producing 3 types of products A, B, C. The production department daily produces components sufficient to make 50 units of A, 25 units of B, and 30 units of C. The management is confronted with the problem of optimizing the daily production of products in assembly department where only 100 man hours are available daily to assemble the products. The following additional information is available.

Type of Product		*Profit per unit product* (Rs.)	*Assembly time per product* (Hrs)
A	...	12	0.8
B	...	20	1.7
C	...	45	2.5

The Company has a daily order commitment for 20 units of product A and a total of 15 units of B and C products. Formulate this problem as a L.P. model so as to maximize the total profit.

26. Solve graphically :

$$\begin{aligned} \text{Maximize} \quad & Z = x_1 + x_2 \\ \text{subject to} \quad & x_1 + x_2 \leq 1 \\ & -3x_1 + x_2 \geq 3 \\ & x_1, x_2 \geq 0. \end{aligned}$$

27. Solve using Simplex method :

$$\begin{aligned} \text{Maximize} \quad & Z = 3x_1 + 2x_2 \\ \text{subject to} \quad & x_1 + x_2 \leq 4 \\ & x_1 - x_2 \leq 2 \\ & x_1, \; x_2 \geq 0. \end{aligned}$$

28. Solve the transportation problem for minimum cost with the cost coefficients, demands and supplies are given below.

	D_1	D_2	D_3	D_4	
O_1	1	2	−2	3	70
O_2	2	4	0	1	38
O_3	1	2	−2	5	32
	40	28	30	42	

29. Determine an initial basic feasible solution to the following transportation problem using Vogel's method.

		Destination				
		D_1	D_2	D_3	D_4	Supply
Source	S_1	1	2	1	4	30
	S_2	3	3	2	1	50
	S_3	4	2	5	9	20
Demand		20	40	30	10	

30. For the game with pay-off matrix :

		Player B		
		B_1	B_2	B_3
Player A	A_1	−1	2	−2
	A_2	6	4	−6

Determine the best strategies for players A and B. Also determine the value of the game. Is the game fair ?

(4 × 2 = 8)

Turn over

Part D

Answer any **two** *questions.*
Each question has weight 4.

31. Use Big M method to solve :

$$\begin{aligned} \text{Maximize } Z &= 2x_1 + x_2 + 3x_3 \\ \text{subject to } & x_1 + x_2 + 2x_3 \leq 5 \\ & 2x_1 + 3x_2 + 4x_3 = 12 \\ & x_1, x_2, x_3 \geq 0. \end{aligned}$$

32. A batch of four jobs can be assigned to five different machines. The set up time for each job on each machine is given below. Find an optimal assignment of jobs to machines which will minimize the total set up time.

		Machines				
		1	2	3	4	5
Jobs	1	10	11	4	2	8
	2	7	11	10	14	12
	3	5	6	9	12	14
	4	13	15	11	10	7

33. Solve the following games whose pay-off matrix is given by :

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	3	−5	0	6
	A_2	−4	−2	1	2
	A_3	5	4	2	3

(2 × 4 = 8)