E 9569 (Pages : 4) Reg. No.....................................

Name.......................................

B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2020

Fourth Semester

Complementary Course—OPERATIONAL RESEARCH

(2013 to 2016 Admissions)

Time : Three Hours Maximum Marks : 80

Part A

Answer **all** *questions.*
Each question carries 1 *mark.*

1. What is operational research ?
2. Write the scope of OR.
3. Write an application of OR.
4. What is a good model ?
5. What is a feasible solution to atransportation problem ?
6. What is a linear programming problem ?
7. What are artificial variables ?
8. What is an unbalanced assignment problem ?
9. What is a fair game ?
10. What value of game ?

(10 × 1 = 10)

Part B

Answer any **eight** *questions.*
Each question carries 2 *marks.*

11. What are the features of OR ?
12. Write a note on deterministic model.
13. What are the limitations of OR ?
14. Differentiate feasible solution and optimal solution.

Turn over

15. What is duality in linear programming ?

16. Write a note on simplex method.

17. Write a note on transportation problem.

18. List the assumptions of a game.

19. What is pure strategy ?

20. Cite any *two* areas whereassignment technique is applied.

21. What is saddle point ?

22. What is a strategy in game ?

(8 × 2 = 16)

Part C

Answer any **six** *questions.*
Each question carries 4 *marks.*

23. Model building is the essence of the OR approach. Explain.

24. What are the essential ingradients of linear programming problems ?

25. A company produces two types of cow boy hats. Each hat of the first type requires twice as much labour time as the second type. If all hats are of the second type only, the company can produce a total of 500 hats a day. The market limits daily sales of the first and second types to 150 and 250 hats. Assuming that the profit per hat are Rs. 8 for type I and Rs. 5 for type II, formulate the problem as a linear programming model in order to determine number of hats to be produced of each type to maximise the profit.

26. Solve the following problem graphically :

Maximize $Z = 5x_1 + 8x_2$

subject to
$$3x_1 + 2x_2 \leq 36$$
$$x_1 + 2x_2 \leq 20$$
$$3x_1 + 4x_2 \leq 42$$
$$x_1, x_2 \geq 0.$$

27. Explain the North West Corner rule with an example.

28. Find the optimum solution to the following assignment problem showing the cost (Rs.) for assigning workers to jobs :

		Job		
	A	18	17	16
Workers	B	15	13	14
	C	19	20	21

29. Show that assignment problems are particular cases of transportation problems.

30. State whether the following game matrix has a saddle point $\begin{bmatrix} 1 & 0 \\ -4 & 3 \end{bmatrix}$.

31. Show how a game problem can be formulated as a linear programming problem.

(6 × 4 = 24)

Part D

Answer any **two** *questions.*
Each question carries 15 *marks.*

32. Solve the following LPP using simplex method :

Maximize $Z = 4x_1 + 10x_2$
subject to $2x_1 + x_2 \leq 50$
$2x_1 + 5x_2 \leq 100$
$2x_1 + 3x_2 \leq 90$
$x_1, x_2 \geq 0.$

33. Solve using Big-M method :

Minimize $Z = 5x_1 + 3x_2$
subject to $2x_1 + x_2 \geq 3$
$x_1 + x_2 \geq 2$
$x_1, x_2 \geq 0.$

34. Solve the following transportation problem :

Plant	Market A	B	C	D	Available
X	10	22	10	20	8
Y	15	20	12	8	13
Z	20	12	10	15	11
Required	5	11	8	8	

35. Apply dominance rule and solve the following game problem :

$$A \overset{B}{\begin{bmatrix} 1 & 7 & 2 \\ 6 & 2 & 7 \\ 6 & 1 & 6 \end{bmatrix}}.$$

(2 × 15 = 30)