THIRD SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2017

(CUCBCSS—UG)

Complementary Course

BCA 3C 06—OPERATIONS RESEARCH

Time : Three Hours   Maximum : 80 Marks

Part A

Answer **all** *questions in* **one** *word.*
Each question carries 1 mark.

1. Models in which at least one of the components is a random variable are called ————.

2. The variables that we seek to determine in a LPP are called ————.

3. The necessary and sufficient condition for the existence of feasible solution of a transportation problem is that it is ————.

4. A basic solution to the system is degenerate if at least one or more ———— vanish.

5. The total float related to a critical activity is ————.

6. An activity which started immediately after the completion of one or more activities is known as ———— activity.

7. Cost of maintaining an inventory is known as ————.

8. ———— inventories required as protection against the uncertainties of supply and demand of items.

9. The time for which a machine does not have a job to process is called ————.

10. The set of all feasible solutions to linear programming problem forms a ————.

(10 × 1 = 10 marks)

Part B (Short Answer Questions)

Answer **all** *questions.*
Each question carries 2 marks.

11. What is linear programming problem ?

12. Define : (i) Feasible solution and (ii) Optimum solution.

13. What are demand and lead time ?

Turn over

14. Define critical activity.

15. What is no passing rule in a sequencing problem ?

$(5 \times 2 = 10 \text{ marks})$

Part C (Short Essay Questions)

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

16. What are the main characteristics of Operations Research techniques ?

17. Define slack, surplus and artificial variables in LPP.

18. Explain transportation problem. Give its mathematical formulation.

19. Solve the following minimal assignment problem :

15	13	14	17
11	12	15	13
13	12	10	11
15	17	14	16

20. Explain briefly ABC analysis in inventory control.

21. Define duality in LPP and explain the economic interpretation of dual variables.

22. Explain the similarities and differences of PERT and CPM.

23. Describe briefly various types of replacement situations.

$(5 \times 4 = 20 \text{ marks})$

Part D (Essay Questions)

Answer any **five** *questions.*
Each question carries 8 marks.

24. Food X contains 6 units of vitamin A per gram and 7 units of vitamin per gram and costs Rs. 12 per gram. Food Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and costs Rs. 20 per gram. The daily minimum requirement of vitamin A and vitamin B is 100 units and 120 units respectively. Find the minimum cost of product mix by the simplex method.

25. (i) Describe the nature of travelling salesman problem.

    (ii) Explain the dual simplex method.

26. (i) Explain sequencing problem.

(ii) A book binder has one printing press, one binding machine and the manuscripts of a number of different books. The time required to perform the printing and binding operations for each book is shown below. Determine the order in which books should be processed, in order to minimize the total time required to run out all the books :

Job	1	2	3	4	5	6
Processing time (in hrs)	30	120	50	20	90	100
Binding time (in hrs)	80	100	90	60	30	10

27. The time estimates (in weeks) for the activities of a PERT network are given below :

Activity	Optimistic Time	Most likely time	Pessimistic time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

(i) Draw the project network.

(ii) Identify the critical path.

(iii) Determine the expected project length and Variance of project length.

28. Neon lights are replaced at the rate of 100 units per day. It costs $100 to initiate a purchase order. A neon light kept in storage is estimated cost about $0.02 per day. The lead time between placing an order is 12 days. Determine the inventory policy for ordering the neon lights. What is the daily inventory cost associated with the policy ?

29. (i) Explain the costs associated with the inventory control.

(ii) Write short notes on EOQ problem with price breaks.

30. (i) Define assignment problem. How do you interpret assignment problem as a linear programming model ?

(ii) Obtain an initial basic feasible solution to the following transportation problem by Vogel's approximation method :

Factory	Distribution				Supply
	W	X	Y	Z	
A	2	3	11	7	6
B	1	0	6	1	1
C	5	8	15	9	10
Demand	7	5	3	2	17

31. The purchase price of a machine is $ 52000. The installation charges amount to $ 14400 and scrap value is $ 6400. The maintenance cost in various years is given below :

Year	1	2	3	4	5	6	7	8
Maintenance cost in dollar	1000	3000	4000	6000	8400	11600	16000	19200

After how many years should machine be replaced ?

(5 × 8 = 40 marks)