THIRD SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2016

(CUCBCSS—UG)

Complementary Course

BCA 3C 06—OPERATIONS RESEARCH

Time : Three Hours   Maximum : 80 Marks

Section A

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

1. In replacement models, gradual failure in the items results in :

    (a) Increased running costs.   (b) Decrease in its productivity.

    (c) Decrease in the resale value.   (d) All of these.

2. If the probability of failure in the beginning of the life of an item is more but as time passes the chances of its failure become less, then such failure is said to be :

    (a) Retrogressive.   (b) Random failure.

    (c) Progressive failure.   (d) None of these.

3. An activity which must be completed before one or more other activities start is known as :

    (a) Predecessor activity.   (b) Successor activity.

    (c) Dummy activity.   (d) None of these.

4. The cost associated with holding units of a product in inventory is called :

    (a) Holding cost.   (b) Shortage cost.

    (c) Ordering cost.   (d) Setup cost.

5. If two constraints do not intersect in the positive quadrant of the graphical solution of linear programming problem, then :

    (a) The solution is feasible.

    (b) The solution is unbounded.

    (c) One of the constraint is redundant.

    (d) None of these.

6. The dual of the primal maximization LPP having m constraints and n non-negative variables should :

    (a) Have n constraints and m non-negative variables.

    (b) Be a minimization LPP.

    (c) Both (a) and (b).

    (d) Neither (a) nor (b).

7. Which of the following method is used to find the optimum solution of the transportation problem ?

    (a) Least cost method.   (b) Vogel's approximation method.

    (c) North-West corner method.   (d) Modified Distribution method.

8. Which of the following is not an assumption of sequencing problem ?

    (a) The processing times on different machines are exactly known and are independent of the order of the jobs in which they are to be processed.

    (b) The time taken by the jobs in moving from one machine to another is negligible.

    (c) Once a job has begun on a machine it must be completed before another job can begin on the same machine.

    (d) More than one job can be processed on a given machine at a time.

9. Which of the following decisions need to be made in managing inventories :

    (a) How much is to order for each replenishment ?

    (b) When it is necessary to place an order to replenish inventory ?

    (c) How much is to produce for each replenishment ?

    (d) All of these.

10. An assignment problem can be solved by :

    (a) Simplex method.   (b) Transportation method.

    (c) Hungarian method.   (d) All of these.

                                     (10 × 1 = 10 marks)

Section B

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

11. Define the dual of a LPP. Also explain the primal dual relationship.

12. What is meant by unbalanced transportation problem ? Explain the method for solving such problem.

13. What is network analysis ? When is it used ?

14. Explain the terms (i) Safety stock ; (ii) Lead time ; (iii) EOQ.

15. What is replacement ? Describe some important replacement situations.

                                     (5 × 2 = 10 marks)

Section C

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

16. Explain the two-phase method of solving linear programming problem.

17. Explain the rules for converting primal LPP to dual LPP. What are the advantages of duality ?

18. What is an assignment problem ? If the objective function is of maximization, what modifications are needed in the assignment algorithm to achieve the maximal assignment ?

19. Explain degeneracy in a transportation problem. Explain how one overcomes it.

20. Derive the economic order quantity for an inventory problem with no shortage and several production runs of unequal length.

21. A contractor has to supply 10000 bearings per day to an automobile manufacturer. He finds that when he starts a production run, he can produce 25000 bearings per day. The cost of holding a bearing in stock for one year is 20 paise, and set up cost of a production run is Rs. 18,000. How frequently should production run be made ?

22. Distinguish between CPM and PERT.

23. Describe the problem of replacement of items whose maintenance costs increase with time assuming that the value of money remains constant.

(5 × 4 = 20 marks)

Section D

Answer any five questions.
Each question carries 8 marks.

24. A manufacturer offered 2 machines A and B. A is priced at Rs. 5,000 and running costs are estimated at Rs. 800 for each of the first 5 years, increasing by Rs. 200 per year in the sixth and subsequent years. Machine B, which has the same capacity as A, costs Rs. 2,500 but will have running costs of Rs. 1,200 per year for 6 years, increasing by Rs. 200 per year thereafter. If money is worth 10% per year, which machine should be purchased ?

25. The following table shows the activities of a network along with their time estimates :

Activity	Optimistic	Most likely	Pessimistic
		Duration (days)	
1—2	3	6	15
1—6	2	5	14
2—3	6	12	30
2—4	2	5	8
3—5	5	11	17
4—5	3	6	15
6—7	3	9	27
5—8	1	4	7
7—8	4	19	28

(i) Draw the network diagram.

(ii) Calculate the length and variance of the critical path.

(iii) What is the approximate probability that the jobs on the critical path will be completed in 41 days ?

Turn over

26. What is ABC analysis ? Why is it necessary ? What are the basic steps in implementing it ?

27. Explain purchase inventory model with 2 price breaks. Find the optimal order quantity for a product for which the price breaks are as follows :

Quantity	Unit Cost (Rs.)
$0 \leq Q_1 < 500$	10
$500 \leq Q_2 < 750$	9.25
$Q_3 \geq 750$	8.75

28. Give Johnson's procedure for determining an optimal sequence for processing n items on 2 machines. There are 5 jobs each of which must go through 2 machines A and B in the order AB. Processing times are given below :

Job	:	1	2	3	4	5
Time for A	:	5	1	9	3	10
Time for B	:	2	6	7	8	4

Determine a sequence for 5 jobs that will minimize the total elapsed time.

29. Solve the following LPP :

Maximize $Z = 7x_1 + 5x_2$ subject to the constraints $x_1 + 2x_2 \leq 6$, $4x_1 + 3x_2 \leq 12$ and $x_1, x_2 \geq 0$.

30. Solve the following transportation problem :

		Warehouses				Availability
		W_1	W_2	W_3	W_4	
	P_1	190	300	400	100	70
Plants	P_2	700	300	400	600	90
	P_3	400	100	600	200	180
Requirement		50	80	70	140	

31. A department head has 4 subordinates, and 4 tasks have to be performed. Subordinates differ in efficiency and tasks differ in intrinsic difficulty. Time each man would take to perform each task is given in the effectiveness matrix. How the tasks should be allocated to each person so as to minimize the total man-hours ?

		Subordinates			
		1	2	3	4
	A	8	26	17	11
	B	13	28	4	26
Tasks	C	38	19	18	15
	D	19	26	24	10

(5 × 8 = 40 marks)