

THIRD SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2015

(CUCBCSS—UG)

Complementary Course

BCA 3C 06—OPERATIONS RESEARCH

Time : Three Hours

Maximum : 80 Marks

Part A*Answer all questions.**Each question carries 1 mark each.*

1. Which of the following is an assumption of Linear Programming ?
 - (a) Divisibility.
 - (b) Additivity.
 - (c) Linearity.
 - (d) All of these.
2. Solution values of decision variables which satisfy the constraints and non-negativity conditions of a general linear programming problem are said to constitute the _____ to that LP model.
 - (a) Feasible solution.
 - (b) Basic feasible solution.
 - (c) Optimum basic feasible solution.
 - (d) Unbounded solution.
3. A transportation problem is said to be a balanced transportation problem if :
 - (a) Total demand = total supply.
 - (b) Total demand > total supply.
 - (c) Total demand < total supply.
 - (d) Total demand \times total supply = 1.
4. Which of the following is a value of decision variable in assignment problem.
 - (a) 0.
 - (b) 1.
 - (c) Both (a) and (b).
 - (d) Neither (a) nor (b).
5. Which of the following is not true in network analysis ?
 - (a) The float of an activity is the amount of time by which it is possible to delay its completion time without affecting the total project completion time.
 - (b) The float of an event is the difference between its latest time and its earliest time.
 - (c) The float of an event is the sum of its latest time and its earliest time.
 - (d) Independent float is the amount of time by which it is possible to delay the completion of an activity so that it neither affects the predecessor or successor activities.
6. In PERT analysis the shortest possible time to perform an activity, assuming that everything goes well is called :
 - (a) Optimistic time.
 - (b) Pessimistic time.
 - (c) Most likely time.
 - (d) None of these.

Turn over

7. In replacement problem, as the life of an item increases, the operational efficiency also deteriorates resulting in :
- (a) Increased running costs. (b) Decrease in its productivity.
 (c) Decrease in the resale value. (d) All of these.
8. In replacement model 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) Progressive failure. (b) Retrogressive failure.
 (c) Random failure. (d) None of these.
9. In sequencing problem the time interval between starting the first job and completing the last job including the idle time in a particular order by the given set of machines is called :
- (a) Total elapsed time. (b) Processing time.
 (c) Idle time. (d) None of these.
10. The time gap between placing of an order and its actual arrival in the inventory is called :
- (a) Order cycle. (b) Lead time.
 (c) Optimum time. (d) None of these.

Part B

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

11. Explain transportation problem and show that it can be considered as an L.P.P.
12. What are the costs associated with inventory? Distinguish between deterministic and probabilistic models in inventory theory.
13. Distinguish between PERT and CPM in network analysis.
14. Explain the use of artificial variables in L.P.P.
15. What is a replacement problem? When does it arise?

Part C

*Answer any five of the following eight questions.
 Each question carries 4 marks each.*

16. Explain two-phase method of solving a L.P.P.
17. Solve the following L.P.P. graphically

Maximize $Z = 4x_1 + 3x_2$ subject to the constraints $2x_1 + x_2 \leq 1000$, $x_1 + x_2 \leq 800$, $x_1 \leq 400$ and $x_2 \leq 700$ and $x_1 \geq 0$ and $x_2 \geq 0$.

18. Explain any one method to obtain an initial basic feasible solution for a transportation problem.

19. Solve the following assignment problem.

	I	II	III	IV
A	12	30	21	15
B	18	33	9	31
C	44	25	24	21
D	23	30	28	14

20. What is EOQ ? Derive the EOQ for deterministic inventory model with uniform demand and without shortage.

21. Determine the optimal economic order quantity for a product having the following characteristics
Annual demand = 2400 units, ordering cost = Rs. 100 and cost of storage = 24% of the unit cost.

Quantity ... Unit cost (Rs.)

$0 \leq Q < 500$... 10

$Q \geq 500$... 9

22. Explain the steps involved in PERT calculations.

23. The cost of a machine is Rs. 6100 and its scrap value is only Rs,100. The maintenance costs are found from experience to be as under

Year	1	2	3	4	5	6	7	8
Maintenance cost	100	250	400	600	900	1250	1600	2000

When should the machine be replaced.

Part D

Answer any **five** of the following **eight** questions.
Each question carries 8 marks each.

24. Solve the following L.P.P.

Maximize $Z = 5x_1 + 3x_2$ subject to the constraints $x_1 + x_2 \leq 2$, $5x_1 + 2x_2 \leq 10$, $3x_1 + 8x_2 \leq 12$ and

$x_1, x_2 \geq 0$.

25. Solve the following transportation problem.

	D ₁	D ₂	D ₃	D ₄	Supply
S ₁	3	7	6	4	5
S ₂	2	4	3	2	2
S ₃	4	3	8	6	3
Demand	3	3	2	2	

26. Give in detail the computational procedure of solving the assignment problem.
27. Develop a model for the replacement of items whose maintenance cost increase with time and value of money remains same during the period.
28. An oil engine manufacturer purchases lubricants at the rate of Rs. 42 per piece from a vendor. The requirement of these lubricants is 1800 per year. What should be the order quantity per order if the cost per placement of an order is Rs. 16 and the inventory carrying charge per rupee per year is only 30 paise ? Also determine the optimum order time.
29. A project schedule has the following characteristics

Activity	...	Time
1—2	...	4
1—3	...	1
2—4	...	1
3—4	...	1
3—5	...	6
4—9	...	5
5—6	...	4
5—7	...	8
6—8	...	1
7—8	...	2
8—10	...	5
9—10	...	7

Construct network diagram. Also find the critical path.

30. Derive the formula for economic order quantity for the manufacturing inventory model without shortages.
31. Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines.

Tasks	A	B	C	D	E	F	G	H	I
Machine I	2	5	4	9	6	8	7	5	4
Machine II	6	8	7	4	3	9	3	8	11