

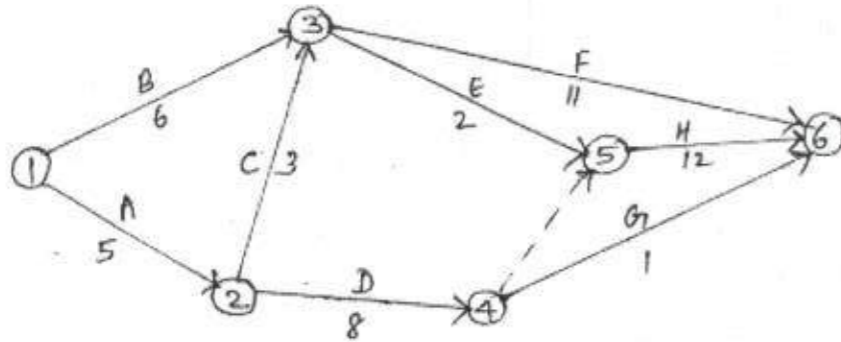


Answer **any one** essay questions out of 2 :

(1×10=10)

34. Using two phase method, solve the LPP : Minimize $z = 4x_1 + x_2$ subject to $3x_1 + x_2 = 3, 4x_1 + 3x_2 \leq 6, x_1 + 2x_2 \geq 4, x_1, x_2 \geq 0$.

35. Determine the critical path for the project network given below. All the durations are in days :



Reg. No. :

Name :

**IV Semester B.Sc. Hon's (Mathematics) Degree (Reg./Supple./Improve.)
Examination, May 2016
BHM 403 : OPERATIONS RESEARCH**

Time : 3 Hours

Max. Marks : 80

Answer **all** the **ten** questions :

(10×1=10)

1. What do you mean by artificial variables ?
2. Compare basis and non-basic variables.
3. What is the optimality condition for simplex method ?
4. What are the rules for constructing the dual LPP from its primal ?
5. List any three cases that can arise in post-optimal analysis of an LPP and the action needed to obtain the new solution.
6. What do you mean by a balanced transportation problem ?
7. How to convert an unbalanced assignment problem to a balanced one ?
8. What do you mean by transshipment model ?
9. Define a connected network.
10. Explain the terms critical activity, noncritical activity and an event of a network.

Answer **any 10** short answer questions out of 14 :

(10×3=30)

11. Express the following linear programming problem into standard form :
Minimize $Z = x_1 - 2x_2 + x_3$ subject to
 $2x_1 + 3x_2 + 4x_3 \geq -4, 3x_1 + 5x_2 + 2x_3 \geq 7, x_1 \geq 0, x_2 \geq 0$ and x_3 is unrestricted.
12. Explain graphical method to solve an LPP.



13. Determine all the basic solutions of the LPP : Maximize $z = 2x_1 + 3x_2$ subject to $2x_1 + x_2 \leq 4$, $x_1 + 2x_2 \leq 5$, $x_1, x_2 \geq 0$: and classify them as feasible and infeasible.
14. What are the optimality conditions in *M*-method to solve an LPP ?
15. Write the dual of the LPP : Maximize $z = 5x_1 + 6x_2$ subject to $x_1 + 2x_2 = 5$, $-x_1 + 5x_2 \geq 3$, $4x_1 + 7x_2 \leq 8$, $x_2 \geq 0$ and x_1 unrestricted.
16. Write a note on advantages of using dual LPP instead of primal LPP.
17. Explain Vogel approximation method to find the starting solution of a transportation problem.
18. What is the number of basic variables in a transportation problem with a transportation matrix of order $m \times n$?
19. Explain assignment problem as a special case of transportation problem.
20. Draw the network defined by $N = \{ 1, 2, 3, 4, 5, 6 \}$ and $A = \{(1, 2), (1, 5), (2, 3), (2, 4), (3, 4), (3, 5), (4, 3), (4, 6), (5, 2), (5, 6)\}$.
21. Write Floyd's algorithm for shortest route problem.
22. Explain the linear programming formulation of CPM.
23. Explain backward pass critical path calculations.
24. Write the important steps of PERT procedure.

Answer any 6 short answer questions out of 9 : (6x5=30)

25. Using graphical method, solve the LPP : Maximize $z = 4x_1 + 3x_2$ subject to $2x_1 + x_2 \leq 72$, $x_1 + 2x_2 \leq 48$, $x_1, x_2 \geq 0$.
26. Write a note on degeneracy, cycling and unbounded solutions in LPP.
27. Briefly explain economic interpretation of dual variables.
28. Explain dual simplex algorithm.



29. Using North-west corner method find a starting solution to the transportation problem :

	D ₁	D ₂	D ₃	D ₄	Demand
O ₁	6	4	1	5	14
O ₂	8	9	2	7	16
O ₃	4	3	6	2	5
Supply	6	10	15	4	35

30. Explain the simplex explanation of the method of multipliers to solve transportation problem.
31. Solve the assignment problem :

	W ₁	W ₂	W ₃	W ₄
J ₁	5	7	11	6
J ₂	8	5	9	6
J ₃	4	7	10	7
J ₄	10	4	8	3

32. Write the maximal flow algorithm.
33. A project consists of ten activities (A, B, C,J) with the following precedence relation and time estimates. Draw the project network.

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor(s)	-	-	-	-	A,B	E	F	D	G, H	C, I
Duration (weeks)	3	2	4	3	2	4	2	1	2	4