



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

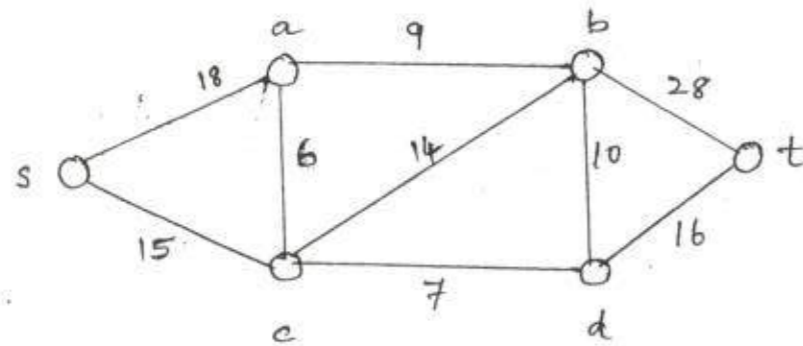
(1×10=10)

34. Using M-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. Apply Dijkstra's algorithm to find the shortest route from s to t in the following graph :



Reg. No. :

Name :

IV Semester B.Sc. (Hon's) Degree (Mathematics) (Regular)

Examination, May 2015

BHM – 403 : OPERATIONS RESEARCH

Time : 3 Hours

Max. Marks : 80

Answer **all the ten** questions :

(10×1=10)

1. What do you mean by slack variables ?
2. What do you mean by basic solution of an LPP ?
3. What do you mean by degeneracy in LPP ?
4. What is the effect of dual variables if the primal constraints are equations ?
5. What is the relation between primal objective value and dual objective value of an LPP ?
6. Define a transportation model.
7. What do you mean by a balanced assignment problem ?
8. What do you mean by transshipment model ?
9. Define a network.
10. What do you mean by PERT ?

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

(10×3=30)

11. What are the conditions required for the standard form of an LPP ?
12. Explain graphical method to solve a LPP.

13. Find all the basic solutions of the equations $2x_1 + x_2 + 4x_3 = 11$, $3x_1 + x_2 + 5x_3 = 14$.
14. What are the optimality conditions in simplex method?
15. Write the dual of the LPP : maximize $z = 5x_1 + 12x_2 + 4x_3$ subject to $x_1 + 2x_2 + x_3 \leq 10$, $2x_1 - x_2 + 3x_3 = 8$, $x_1, x_2, x_3 \geq 0$.
16. Write a note on post-optimal analysis in LPP.
17. Explain North-west corner method to find the starting solution of a transportation problem.
18. How to convert an unbalanced transportation problem to a balanced one?
19. Give any two applications of assignment problem.
20. Draw the network representing Konigsberg problem.
21. Write minimal spanning tree algorithm.
22. Write the linear programming formulation of shortest route problem.
23. Explain the terms float, total float and free float.
24. Distinguish PERT and CPM.

Answer any 6 short answer questions out of 9 : (6×5=30)

25. Using graphical method, solve the LPP : Maximize $z = 2x_1 + 3x_2$ subject to $2x_1 + x_2 \leq 4$, $x_1 + 2x_2 \leq 5$, $x_1, x_2 \geq 0$.
26. Construct first two simplex tables for the LPP :
Maximize $z = 2x_1 + 4x_2 + 4x_3 - 3x_4$ subject to
 $x_1 + x_2 + x_3 = 4$, $x_1 + 4x_2 + x_4 = 8$, $x_1, x_2, x_3, x_4 \geq 0$ without using any artificial variables.
27. What are the rules for constructing dual LPP from its primal?
28. Explain dual simplex algorithm.

29. Using least-cost method find a starting solution to the transportation problem :

	D ₁	D ₂	D ₃	Demand
O ₁	1	2	3	50
O ₂	3	2	1	80
O ₃	4	5	6	75
O ₄	3	1	2	95
Supply	120	80	100	300

30. Explain Hungarian method to solve an assignment problem.
31. Solve the assignment problem :

	W ₁	W ₂	W ₃	W ₄
J ₁	10	12	19	1
J ₂	5	10	7	8
J ₃	12	14	13	11
J ₄	8	15	11	9

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

Job	A	B	C	D	E	F	G	H	I
Predecessor	-	-	A, B	A, B	B	D, F	C, F	D, E	G, H
Time (days)	15	10	10	10	5	5	20	10	15