

**MBA-2 Sem.-3 Examination**  
**MS**

Time : 2-30 Hours]

January-2025

[Max. Marks : 70

- Instructions: (1) This paper contains **FIVE** questions.  
 (2) All questions are compulsory.  
 (3) Question No.2, 3, 4 have internal options.  
 (4) Figures in the right side in parenthesis indicate marks.  
 (5) Use of scientific calculator is allowed.

- Q:1** Answer the following. **(14)**
1. Methods of transportation problems
  2. Hungarian assignment method

- Q:2 (a)** A firm owns facilities at six places. It has manufacturing plants at places A, B and C with daily production of 50, 40 and 60 units respectively. At point D, E and F it has three warehouses with demands of 20, 95 and 35 units respectively. Per unit shipping costs are given in the following table. Calculate IBFS by any method of your choice. **(07)**

Source/Destinations	D	E	F
A	10	12	7
B	14	11	6
C	9	5	13

- Q:2 (b)** From the following time matrix (in minutes) solve the assignment using HAM. **(07)**

Worker/Job	I	II	III	IV
1	10	12	7	1
2	14	11	6	5
3	9	5	13	7
4	11	7	9	12

**OR**

- Q:2 (a)** 1. Infeasibility & unboundedness in graphical method of LPP **(07)**  
 2. Travelling salesman problem v/s assignment problem

- Q:2 (b)** Answer the following **(07)**

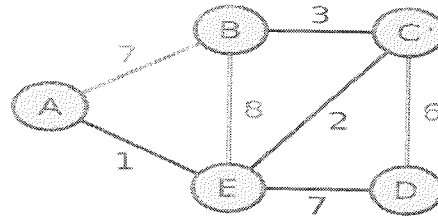
1. Transition Matrix
2. LPP v/s IPP
3. Economic interpretation of dual problem

**Q:3 (a)** Write a detailed note on network techniques. (07)

**Q:3 (b)** Write a detailed note on queuing theory. (07)

**OR**

**Q:3 (a)** (07)



From the above diagram, find the shortest path.

**Q:3 (b)** The Tit-Fit Scientific Laboratories is engaged in producing different types of high-class equipment for use in science laboratories. The company has two different assembly lines to produce its most popular product 'Pressurex'. The processing time for each of the assembly lines is regarded as a random variable and is described by the following distributions. (07)

Process Time (minutes)	Assembly A <sub>1</sub>	Assembly A <sub>2</sub>
10	0.10	0.20
11	0.15	0.40
12	0.40	0.20
13	0.25	0.15
14	0.10	0.05

Using the following random numbers, generate data on the process times for 15 units of the item and compute the expected process time for the product. For the purpose, read the numbers vertically taking the first two digits for the processing time on assembly A<sub>1</sub> and the last two digits for processing time on assembly A<sub>2</sub>.

4134	8343	3602	7505	7428
7476	1183	9445	0089	3424
4943	1915	5415	0880	9309

**Q:4 (a)** Write the dual of the following LPP: (07)

$$\begin{aligned}
 &\text{Minimise} && Z = 10x_1 + 20x_2 \\
 &\text{Subject to} && 3x_1 + 2x_2 \geq 18 \\
 &&& x_1 + 3x_2 \geq 8 \\
 &&& 2x_1 - x_2 \leq 6 \\
 &&& x_1, x_2 \geq 0
 \end{aligned}$$

**Q:4 (b)** A manufacture of purse makes four styles of purse: a three-compartment bag which takes 45 min to assemble; a shoulder-strap bag, taking one hour to assemble; a tote bag, needing 45 min for assembly, and pocket purse (07)

requiring 30 min to assemble. There are 32 hrs of assembly time available per day. The profit contribution on the sale of a three- compartment bag is Rs 16, Rs 25 on a shoulder-strap bag, and Rs 12 each on tote bag and pocket purse. Special kind of fancy pins are used in decorating pocket purse and they are available for only 30 pieces. Different types of pins are used in other three types of bags of which only 70 are in stock. Enough raw materials is available for total of 60 pocket purse and tote bags which need same quantity of raw material. The manufacturer estimates a min demand of 6 pocket purses and 10 shoulder strap bags every day. Formulate a liner programming problem to optimize daily production.

OR

- Q:4 (a)** A market survey is made on two brands of breakfast foods A and B. Every time a customer purchases, he may buy the same brand or switch to another brand. The transition matrix is given below: (07)

From	T0	
	A	B
A	0.8	0.2
B	0.6	0.4

At present, it is estimated that 60 per cent of the people buy brand A and 40 per cent buy brand B. Determine the market shares of brand A and brand B in the steady state.

- Q:4 (b)** In a certain market, only two brands of lipsticks, A and B, are sold. Given that a lady last purchased lipstick A, there is 80% chance that she would buy the same brand in the next purchase, while if a lady purchased brand B, there is 90% chance that her next purchase would be brand B. Using this information, develop the transition probability matrix. (07)

Calculate

(1) The probability that if a customer is currently a brand A purchaser, she will purchase brand B two purchases from now;

(2) The probability that if a customer is a brand B purchaser, she will purchase brand A three periods from now;

- Q:5** From the following time matrix answer the given questions. (14)

Sources	Distribution Center				Supply
	D1	D2	D3	D4	
S1	12	8 <sup>250</sup>	20 <sup>150</sup>	25	400
S2	6 <sup>200</sup>	11	15 <sup>100</sup>	12	300
S3	9	15	17 <sup>100</sup>	7 <sup>400</sup>	500

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Demand	200	250	350	400	
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Note: Underlined superscript numbers are allocated units.

1. Is this solution feasible?
2. Is this solution balanced?
3. Is this solution degenerate?
4. Is it maximization case?
5. Is this solution optimal? Is it unique? Why?
6. What is the opportunity cost and transportation cost of transporting one unit from source S1 to D4?
7. Calculate  $u_i$  and  $v_j$  for the above matrix.
8. The management is contemplating to embark on an advertisement campaign in one of the distribution centers. Where should it concentrate?
9. Check whether primal and dual have same optimal values