Sr. No. of Question Paper : 7510

Unique Paper Code   :   12481501

Name of the Paper   :   Quantitative Techniques for Management

Name of the Course   :   **B.A. (Hons) Business Economics, 2023 (LOCF)**

Semester   :   V

Duration   :   3 Hours

Maximum Marks   :   75

Instructions for Candidates

1. Write your roll no. on the top immediately after receiving the question paper.

2. Attempt any five questions.

3. The use of a simple calculator and Z-Table is allowed.

4. If you find a missing value in a question, assume a value and solve the question.

1. Smart Exports Ltd. produces two products: X and Y. The requirements and constraints related to their production are provided below:

	Product X	Product Y
Material	8 units	4 units
Labour	6 hrs.	8 hrs.
Machine Hour	4 hrs.	6 hrs.
Contribution	Rs. 14	Rs. 16

During the upcoming accounting cycle/period, there will be a limitation of 2880 labour hours. Only 3440 material units will be available, and the machinery can operate for a maximum of 2760 hours. The sales forecast for product X is anticipated to be 420 units. At the same time, there are no sales constraints for product Y. Formulate the Linear Programming Problem (LPP) and determine the optimal production quantity for each product using simplex method. (15)

2. (a) A company has factories F1, F2, and F3 supplying to warehouses W1, W2, and W3. Weekly capacities for the factories are 200, 160, and 90 units, while warehouse demands are 180, 120, and 150 units, respectively. The unit shipping costs (in Rs.) are provided below:

	W_1	W_2	W_3	Supply
F_1	16	20	12	200
F_2	14	8	18	160
F_3	26	24	16	90
Demand	180	120	150	450

Determine the optimal distribution for this company to minimize the total shipping cost. (10)

(b) In a factory's plant layout modification, four new machines - M1, M2, M3, and M4 - are set to be installed. Five spots are available: A, B, C, D, and E. Due to space constraints, M2 cannot be positioned at spot C, and M3 cannot be located at spot A. The cost of placing a machine in a specific location, measured in hundreds of rupees, is provided below:

P.T.O.

Machine	A	B	C	D	E
M₁	9	11	15	10	11
M₂	12	9	-	10	9
M₃	-	11	12	11	7
M₄	14	8	12	7	8

Find the least cost of allocating the machine. (5)

3. A Project consists of nine activities whose time estimates (in weeks) and other characteristics are given below:

Activity	Preceding Activity (ies)	Time Estimates (weeks)		
		Most Optimistic	Most Likely	Most Pessimistic
A	-	2	4	6
B	-	6	6	6
C	-	6	12	24
D	A	2	5	8
E	A	11	14	23
F	B, D	8	10	12

G	B, D	3	6	9
H	C, F	9	15	27
I	E	4	10	16

(i) Draw a PERT Network and identify the critical activities within the project?

(ii) What is the expected project completion time and its variance?

(iii) What's the likelihood that the project concludes a week earlier than the projected time?

(iv) If the project is required to be completed by December 31 of a given year and the manager wants to be 95% sure of meeting the deadline, what would be the recommended commencement date for this project?

(v) A penalty of Rs 15000 per week will be imposed on the contractor if the project is not completed in 36 weeks. What is the probability that he must pay a penalty? (5*3=15)

P.T.O.

4. (a) In a corporate office, a typing clerk receives an average of 22 documents daily for transcription. The clerk works 8 hours daily, typically taking about 20 minutes to type out each document. The office has identified that the cost incurred due to a copy pending for dispatch (termed as opportunity cost) is 80 paise per hour. Meanwhile, the combined cost of equipment usage and the typist's remuneration comes to Rs. 40 daily.

   (i) Determine the efficiency rate of the typing clerk.

   (ii) On average, how many documents are in the queue awaiting transcription?

   (iii) What's the average waiting duration for a document before it gets transcribed?

   (iv) Estimate the collective cost associated with the documents on hold for dispatch. (8)

   (b) In what Scenario Performance Evaluation Review Technique scores over the Critical Path Method? (7)

5. (a) Mr. Sadhil travels between Mumbai and Delhi for business meetings. He has multiple transport options to reach the airport. The city shuttle costs Rs. 13, but there's a 0.08 probability he'll be late and miss his flight. The luxury hotel car service is priced at Rs. 27, offering a 0.96 chance of reaching on time. For Rs. 4.50, he can hail a regular cab, which boasts a success rate of 99 out of 100 trips arriving on time.

   If Mr. Sadhil gets to his flight promptly, he will seal a deal yielding a profit of Rs. 1000. However, if late, the potential payoff will be forfeited. Based on the Expected Monetary Value (EMV) approach, which transportation method should Mr. Y opt for? (9)

5. (b) How are maximum likelihood and expectation principles as a applied to decision making of choice, differentiated? (6)

OR

Define EVPI. How is it calculated?

P.T.O.

6.   (a) A firm purchases batches of 500 containers for a quarter of the year. Each container has a price tag of Rs. 125, and the cost to place an order stands at Rs. 150. The estimated storage expenses (inventory carrying charge) are about 20% of the individual container's price. Determine the overall costs of the current stock management strategy. Also, what potential savings could be realized by implementing the optimal order quantity?   (10)

     (b) Explain the various costs associated with inventory management.   (5)