Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

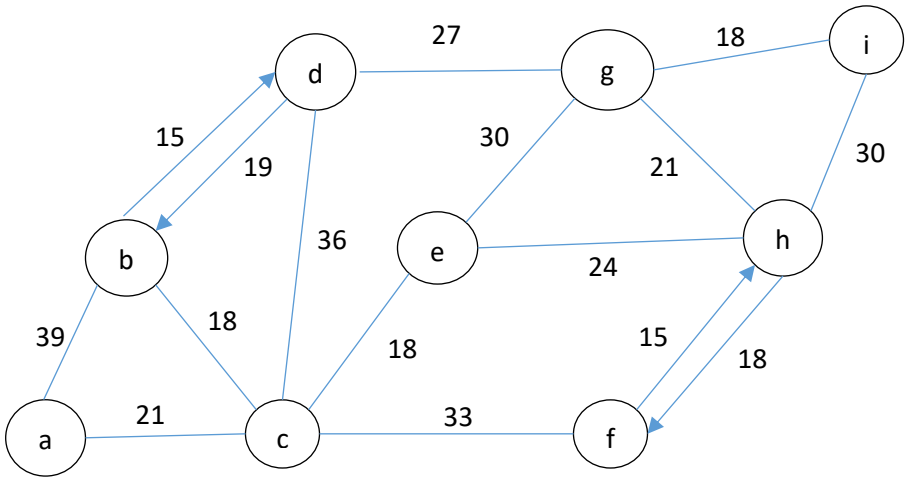
Course: Supply Chain Modeling, Design &Simulation **Semester: III**
Program: MBA LSCM **Time: 03 hrs.**
Course Code: LSCM8026 **Max. Marks: 100**

Instructions: Usage of calculator allowed.

SECTION A
10Qx2M=20Marks

S. No.		Marks	CO
Q 1	Multiple Choice Questions, each carry 2 marks.		
1.1	Which is the driver of supply chain? a) Inventory b) Facility c) Information d) All above	**2**	**CO1**
1.2	Which of the following is NOT an assumption of the economic order quantity model shown below? $Q^* = \sqrt{\frac{2DS}{H}}$ A) Demand is known, constant, and independent. B) Lead time is known and consistent. C) Quantity discounts are not possible. D) Production and use can occur simultaneously.	**2**	**CO1**
1.3	Given an actual demand this period of 103, a forecast value for this period of 99, and an alpha of .4, what is the exponential smoothing forecast for next period? A) 94.6 B) 97.4 C) 100.6 D) 101.6	**2**	**CO1**
1.4	What is the effort to plan the coordination of demand forecasts with functional areas of the firm and its supply chain? A) enterprise resource planning B) material requirements planning C) capacity planning D) sales and operations planning	**2**	**CO1**
1.5	Which of the following represents a valid constraint in linear programming? A) $2X \geq 7XY$	**2**	**CO1**

	B) (2X)(7Y) ≥ 500 C) 2X + 7Y ≥100 D) 2X2 + 7Y ≥ 50		
1.6	If cars sell for $500 profit and trucks sell for $300 profit, which of the following represents the objective function? A) Maximize profit = 500C + 300T B) Minimize profit = 500C + 300T C) Maximize profit = 500C - 300T D) Minimize profit = 300T - 500C	**2**	**CO1**
1.7	Each participant of the game is called……. A) Strategist B) Winner C) Player D) Loser	**2**	**CO1**
1.8	The transportation method is a special case of the family of problems known as what? A) regression problems B) decision tree problems C) linear programming problems D) simulation problems	**2**	**CO1**
1.9	Which of the following statements regarding simulation is TRUE? A) Large-scale simulation models are virtually all handled by computer. B) Simulation has numerous areas of application in operations. C) Simulation attempts to duplicate a real system. D) All of these are true.	**2**	**CO1**
1.10	In queuing problems, which of the following probability distributions is typically used to describe the time to perform the service? A) binomial B) normal C) Poisson D) negative exponential	**2**	**CO1**
SECTION B **4Qx5M= 20 Marks**			
2.1	Explain the Milk-Run model and compare with respect to direct network model.	**5**	**CO2**
2.2	An electronics manufacturer has seen demand for its latest MP3 player increase over the past six months. Observed demand (in thousands) has been $D_1 = 8415$, $D_2 = 8{,}732$, $D_3 = 9014$, $D_4 = 9{,}808$, $D_5 = 10{,}413$, $D_6 = 11{,}961$. Forecast demand for Period 7 using trend-corrected exponential smoothing with a = 0.1, b = 0.2.	**5**	**CO2**
2.3	Explain the vertical Nash game and Stackelberg game with relevant supply chain example.	**5**	**CO2**
2.4	Describe the key important factors which are considered in modeling and designing the global supply chain network.	**5**	**CO2**
SECTION-C **3Qx10M=30 Marks**			

3.1	Explain the steps of Monte Carlo Simulation. Describe the advantages and disadvantages of simulation models.	**10**	**CO3**
3.2	Write the short notes on deterministic inventory model, stochastic inventory model, heuristic and metaheuristic using relevant business examples.	**10**	**CO3**
3.3	A person wishes to go from station a to destination i in the network shown in the figure below. The number on the links represent the cost of travelling from one node to another. Find the least cost route. 	**10**	**CO3**
	SECTION-D **2Qx15M= 30 Marks**		
4.1	X-Tech Inc. produces specialized bolts for the aerospace industry. The operating cost of producing a single bolt is $2.0. The company sells the bolts for $ 6.0 per unit. Each time the company arranges to sell a batch, it incurs a fixed cost of $20. This fixed cost mainly includes administrative expenses. The volume of sales is mainly dependent on the price of the product. The manager has come up with the following relationship between volume and price: Volume = 500-25(Price) However, due to marketing and competitive considerations, X-Tech decided to limit its price to $8. a) State the nonlinear programing formulation of this problem. b) Draw the profit function and feasible solution space. c) Determine the optimal price and optimal volume that will result in the maximum profit. d) Repeat parts a, b, and c, by changing the restriction on price from a maximum of $8 to a maximum of $14.	**15**	**CO4**

4.2	Skycell, a major European cell phone manufacturer, is making production plans for the coming year. Skycell has worked with its customers (the service providers) to come up with forecasts of monthly requirements (in thousands of phones) as shown in Table below. Manufacturing is primarily an assembly operation, and capacity is governed by the number of people on the production line. The plant operates for 20 days a month, eight hours each day. One person can assemble a phone every 10 minutes. Workers are paid 20 euros per hour and a 50 percent premium for overtime. The plant currently employs 1,250 workers. Component costs for each cell phone total 20 euros. Given the rapid decline in component and finished product prices, carrying inventory from one month to the next incurs a cost of 3 euros per phone per month. Skycell currently has a no-layoff policy in place. Overtime is limited to a maximum of 20 hours per month per employee. Assume that Skycell has a starting inventory of 50,000 units and wants to end the year with the same level of inventory. Assuming no backlogs, no subcontracting, and no new hires, what is the LPP model for optimum production planning?	**15**	**CO4**

Month	Demand (in Thousands)
January	1000
February	1100
March	1200
April	1000
May	1500
June	1600
July	1600
August	900
September	1100
October	800
November	1400
December	1700