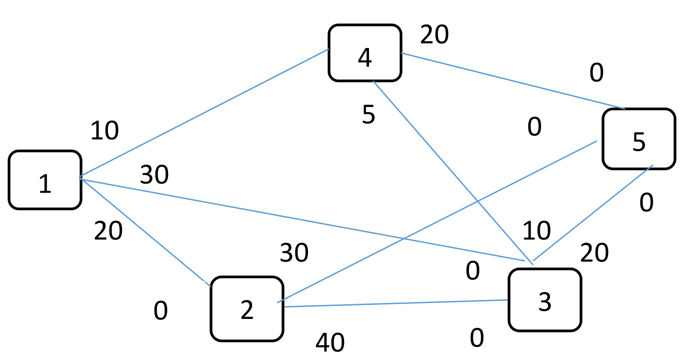
Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Supply Chain Modeling, Design and Simulation **Semester: III**
Programme: MBA LSCM
Time: 03 hrs. **Max. Marks: 100**
Instructions: As per sections

SECTION A

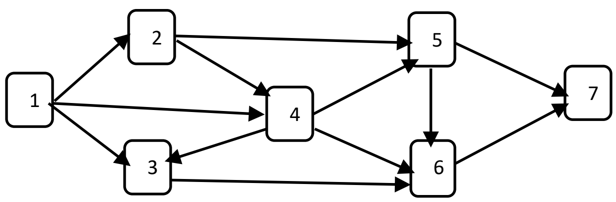
S. No.	**Attempt all questions.**	**Marks**	**CO**
Q 1	Mark True/False (T/F) for the following	**10**	
a)	Two types of algorithms for unconstrained problem are ______________ and ___________.	**2**	**CO2**
b)	The different types of queue disciplines are __________, ____________, ___________ and ____________.	**2**	**CO1**
c)	The different types of network models are ___________, ______________, ___________ and _____________.	**2**	**CO2**
d)	Equipment replacement problem can be solved using ___________ algorithm.	**2**	**CO3**
e)	One of the key requirements of simulation exercise is that it should allow us to generate ___________ numbers for different demand distributions	**2**	**CO4**
Q 2	Multiple Choice questions	**10**	
a)	Forecasts are never correct, but every organization and industry does forecasts because a) They want to know, how much wrong is their forecast? b) They endeavor to reduce to forecasting error c) They plan the future with wrong forecasts; something is better than nothing d) None of the above	**2**	**CO3**
b)	MSE for forecasting errors 4, 8, -10, 6, -12, 8, is a) 85 b) 78 c) 65 d) 71	**2**	**CO2**

c)	Which of the following method is best for forecasting ice cream demand a) Delphi Technique b) Mean Absolute Deviation c) Winter's Model d) Exponential smoothing	**2**	**CO2**
d)	Slack of a constraint represents a) difference between RHS and LHS of a ≤ constraint b) difference between LHS and RHS of a ≥ constraint c) the unused resource d) both a and c above	**2**	**CO1**
e)	Moving from MTS to CTO model is an example of a) Agility b) Postponement c) Reverse Logistics d) Cost Leadership	**2**	**CO3**
	SECTION B		
	Attempt any two questions. Each question carries 5 marks.	**10**	
Q3	What is Mathematical Modelling? Give example.	**5**	**CO1**
Q4	Non-stationary Time Series data, has four components; what are they?	**5**	**CO2**
Q5	Derive the steady state probability for n customers in a system for General Poisson queuing model.	**5**	**CO3**
Q6	What are the distinct types of simulation models?	**5**	**CO4**
	SECTION-C		
	Note: Attempt any four questions. Each question carries 10 marks.	**40**	
Q7	For the network below, find the maximum flow from node 1 to node 5 	**10**	**CO2**

Q8	You are given a time series model with demand values 4,7,9,13,16, and 18. Fit a linear model using Holt's method and find the forecast for period 6. Given $\alpha = 0.2$, $\beta = 0.3$	**10**	**CO4**

Q9 — **10** — **CO3**

Figure below provides the communication network between stations 1 and 7. The probability that a link in the network will operate without failure(WFP) is shown in table for each arc. Messages are sent from station 1 to station 7, and the objective is to determine the route that maximises the probability of a successful transmission. Formulate the situation as a shortest route model, and determine the optimum solution.



Arc	1-2	1-3	1-4	2-4	2-5	3-6	4-3	4-5	4-6	5-6	5-7	6-7
WFP	0.8	0.3	0.65	0.9	0.5	0.95	0.85	0.7	0.6	0.5	0.8	0.9

Q10	The time between arrivals at the state revenue office is exponential with mean value 0.05 hours. The office opens at 8:00 am. a) Write the exponential distribution that describes the interarrival time. b) Find the probability that no customers will arrive at the office by 08:15 am.	**10**	**CO3**
Q11	Consider the game in which two players Jan and Jim take turns in tossing a fair coin. If the outcome is heads, Jim gets $10 from Jan. Otherwise Jan gets $10 from Jim. How is the game simulated as a Monte Carlo experiment?	**10**	**CO4**

SECTION-D

	Note: Attempt any three questions. Each question carries 10 marks	**30**	
Q12	Figure below gives the mileage of the feasible links connecting nine offshore natural gas wellheads with an inshore delivery point. Because wellhead 1 is closest to shore, it is equipped with sufficient pumping and storage capacity to pump the output of the remaining eight wells to the delivery point. Determine the minimum pipeline network that links the wellheads to the delivery point.	**10**	**CO2**

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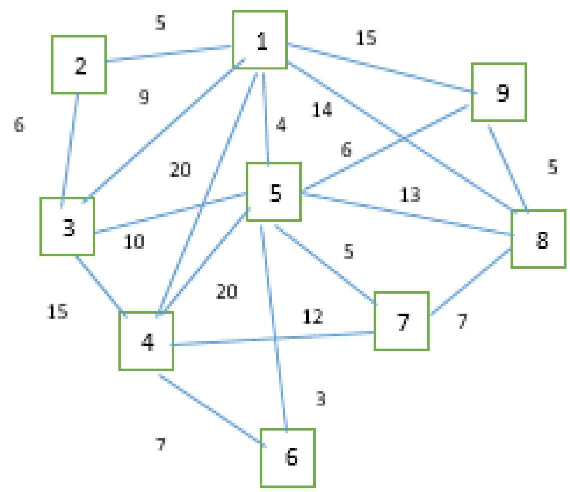
<tr><td></td><td>
</td><td></td><td></td></tr>
<tr><td>Q13</td><td>John Macko is a student of Ozark U. He does odd jobs to supplement his income. Job requests come every 5 days on the average, but the time between requests is exponential. The time for completing a job is also exponential with mean 4 days.
a) What is the probability that John will be out of jobs?
b) If John gets about $50 a job, what is his average monthly income?
c) If at the end of the semester, John decides to subcontract on the outstanding jobs at $40 each. How much on an average should he expect to pay?</td><td>10</td><td>CO4</td></tr>
<tr><td>Q14</td><td>Maximize $f(x) = \begin{cases} 3x, & 0 \leq x \leq 2 \\ \frac{1}{3(-x+20)}, & 2 \leq x \leq 3 \end{cases}$</td><td>10</td><td>CO1</td></tr>
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