

JK LakshmiPat University Jaipur
INSTITUTE OF ENGINEERING & TECHNOLOGY

Theory Examination-III (Regular), December 2023

B.Tech (CSE/ECE), Semester VII

Roll No.

Course Name: Operations Research

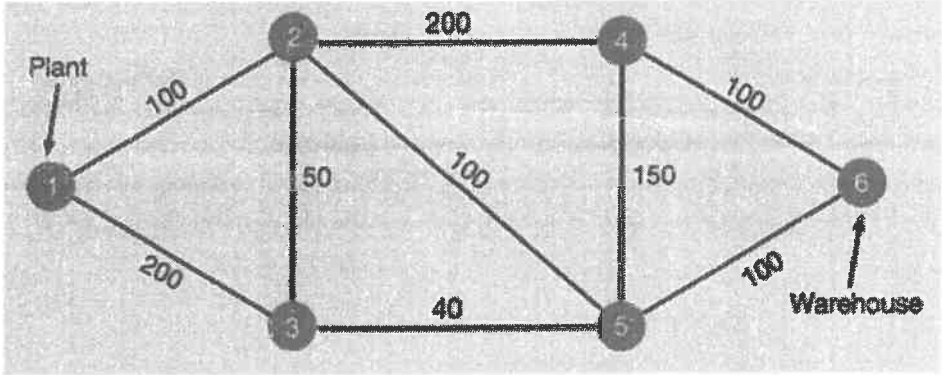
Time: 2.5 hours

Max. Marks: 30

Course Code: AS1201

Instructions to students:

1. Do not write anything other than your roll number on the question paper.
2. Use of calculator is allowed. Be Neat! Be Legible!! All the best!!!!

Q.1	Zentio Company is a retail business that sells a popular product throughout the year. The annual demand for this product is 5,000 units, and the cost of placing an order is \$50. The product's carrying cost is \$2 per unit per year. Calculate the Economic Order Quantity (EOQ) for Zentio Company and the total annual cost associated with this optimal order quantity.	2.5 [CO1,2,3,4]
Q.2	Draw the bathtub for software and hardware. Also, explain the reliability for both.	2.5 [CO1,2,4]
Q.3	Assume that a man's profession can be classified as professional, skilled labourer, or unskilled labourer. Assume that, of the sons of professional men, 80 percent are professional, 10 percent are skilled labourers, and 10 percent are unskilled labourers. In the case of sons of skilled labourers, 60 percent are skilled labourers, 20 percent are professional, and 20 percent are unskilled. Finally, in the case of unskilled labourers, 50 percent of the sons are unskilled labourers, and 25 percent each are in the other two categories. Assume that every man has at least one son and form a Markov chain by following the profession of a randomly chosen son of a given family through several generations. Set up the matrix of transition probabilities. Find the probability that a randomly chosen grandson of an unskilled labourer is a professional man.	03 [CO1,2,6]
Q.4	Every day, MISHO Corporation Design must transport beds, chairs, and other furniture items from the factory to the warehouse. This involves going through several cities. MISHO Corporation Design would like to find the route with the shortest distance. The road network is shown in below given figure 1.  Figure 1: Roads from MISHO Corporation Design Plant	03 [CO1,2,4,6]

Q.5 Suppose that you want to launch any new product in the market. Develop supply chain management and supply chain strategy for your planning. 03
[CO1,2,3,4,6]

Q.6 Perform the ABC analysis on the following samples of drugs: 04
[CO1,2,3,4,6]

Item Name	Annual Consumption (units)	Price per unit (Rs.)
Drug I	300	10
Drug II	2100	15
Drug III	44	10
Injection I	1100	5
Injection II	40	5
Injection III	200	100
Drug - V	700	7
Drug - IX	80	11

Q.7 Consider a system composed of a heater (R1), two pumps (R2 and R3), and 5 turbines (R4 through R8) shown in figure 2. The two pumps work in parallel, meaning that the pump subsystem operates if at least one of the pumps operates. The turbine sub-system operates if at least 3 turbines operate. The heater, pump, and turbine sub-systems are connected in series, meaning that they must all properly work for the whole system to perform adequately. 05
[CO1,2,3,5,6]

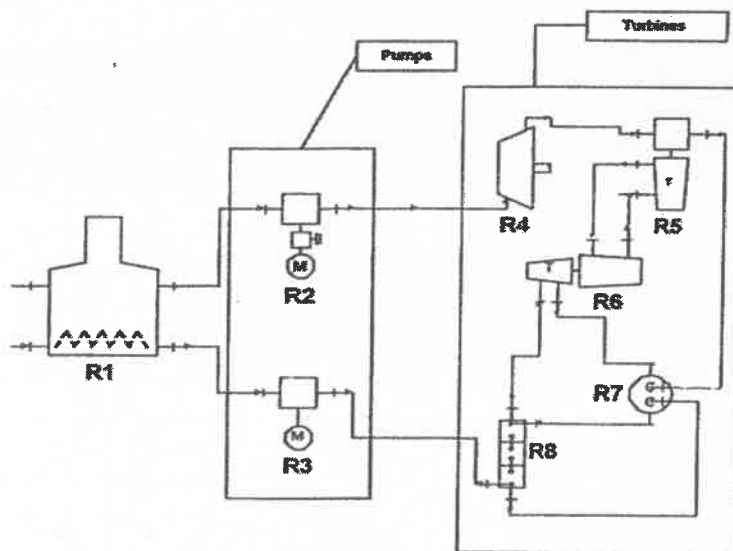


Figure 1: Proposed System

Between two scheduled maintenances, each component may fail independently of the others, with the following probabilities shown in below table:

R1	R2	R3	R4	R5	R6	R7	R8
0.05	0.10	0.08	0.20	0.17	0.09	0.15	0.15

Find the reliability of considered system.

- Q.8 A construction project for Janta Bank Building has a list of tasks to be performed whose activities and time estimates are given in the Tables 1 and 2, respectively, as follows.

07
[CO1,2,3,4,6]

Table 1. Description of all activities to complete the whole work of construction

Activity	Activity Description	Predecessors
A	Project Initiation	-
B	Earth Excavation	A
C	Sand Test	A
D	Sand Filling	B,C
E	Soling (Concrete Casting)	D
F	Footing	E
G	Short Column	F
H	Grade Beam	G
I	Sand Filling cum Earthwork	G
J	Column Cum Soling(Super Structure)	I
K	Ground Floor Slab cum beam	J
L	Ground Floor Wall Construction	K
M	First Floor Column	L
N	First Floor Slab	M
O	First Floor Wall Construction	N
P	Finishing	L,O

Table 2. Predecessors and three time estimates of construction of Janata Bank building

Activity	Predecessors	Optimistic Time (o) days	Most Likely Time(m) days	Pessimistic Time(p) days
A	-	10	12	18
B	A	5	6	13
C	A	1	2	3
D	B,C	12	15	26
E	D	4	6	10
F	E	22	25	38
G	F	7	10	15
H	G	17	20	24
I	G	12	15	21
J	I	43	45	50
K	J	56	60	66
L	K	6	7	11
M	L	20	22	26
N	M	42	45	50
O	N	6	8	13
P	L,O	68	70	90

- Draw a Network diagram with critical path of construction Janata Bank building.
- Calculate expected time duration, variances, and standard deviation of the project activities.
- Earliest and latest starting and finishing time of the activities of the project.
- Determine the critical path and total project completion time in days.

