



- 3 a. What is Simulation? (03 Marks)  
 b. Bring out the difference between Critical Path Method (CPM) and Project Evaluation Review Technique (PERT) Method. (07 Marks)  
 c. Explain different models of Operations Research. (10 Marks)

- 4 a. Explain Total float and Free float. (03 Marks)  
 b. Draw an network diagram showing the following relationship : (07 Marks)

Activity	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Immediate Predecessor	-	-	-	A, B	B, C	A, B	C	D, E, F	D	G	G	H, J	K	I, L

- c. Solve the following transportation problem using VAM method and test for optimality. (10 Marks)

		Destination				
		P	Q	R	S	Supply
Source	A	21	16	25	13	11
	B	17	18	14	23	13
	C	32	17	18	41	19
	Demand	6	10	12	15	43

- 5 a. Define a Saddle point. (03 Marks)  
 b. Explain Queuing system. (07 Marks)  
 c. Solve the following game graphically and find the value.

Player B

Player A  $\begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$

- 6 a. What do you mean by degeneracy in transportation problem? (03 Marks)  
 b. Explain decision making process. (07 Marks)  
 c. Customers arrive at a one window drive in bank according to Poisson distribution with mean 10/hour. Service time per customer is exponential with mean 5 minutes the space in front of the window including that for the serviced car can accommodate a maximum of 3 cars others can wait outside this space.  
 i) What is the probability that an arriving customer can drive directly to the space in front of the window?  
 ii) What is the probability that an arriving customer will have to wait outside the indicated space?  
 iii) How long is an arriving customer expected to wait before starting service? (10 Marks)

- 7 a. Explain any three assumptions of sequencing or scheduling. (03 Marks)  
 b. Schedule the following jobs using Johnson's rule and find total elapsed time : (07 Marks)

	Processing time for Jobs				
Machines	A	B	C	D	E
M <sub>1</sub>	4	13	7	12	6
M <sub>2</sub>	3	15	5	6	11

- c. A project manager has obtained the following optimistic, pessimistic and most likely times in weeks relating to the various activities related to the construction of a power project.

Activity Sequence	Time Estimates		
	Optimistic	Most likely	Pessimistic
1-2	6	9	18
1-3	5	8	17
2-4	4	7	22
2-5	4	7	10
3-4	4	7	16
3-5	2	5	8
4-5	4	10	22

- i) Draw a PERT diagram and mark clearly the critical path.  
 ii) What is the probability that the power project would be successfully completed in 32 weeks? Area Table data : (10 Marks)

$\frac{X - \mu}{\sigma}$	0.42	0.50	1.00
Area	0.1628	0.1915	0.3413

- 8 a. Use graphical method to solve the following LP problem :

$$\text{Maximize } Z = -x_1 + 2x_2$$

$$\text{Subject to constraints } -x_1 + 3x_2 \leq 10$$

$$x_1 + x_2 \leq 6$$

$$x_1 - x_2 \leq 2$$

$$x_1, x_2 \geq 0.$$

(10 Marks)

- b. XYZ Bakery keeps stock of a popular brand of cake. Previous experience indicates the daily demand as given below :

Daily Demand	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Consider the following random numbers :

R.No. 48, 78, 19, 51, 56, 77, 15, 14, 68, 09.

Simulate the demand for the next 10 days. Find out the stock situation if the owner of the bakery decides to make 30 Cakes every day. (10 Marks)

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