

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VI Examination-Nov/Dec-2011****Subject code: 161601****Date: 28/11/2011****Subject Name: Modelling, Simulation and Operation research****Time: 10.30 am -1.00 pm****Total marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 (a) Explain the Methodology of good Operations Research Analysis. **07**

- (b)** The table below records transportation cost per unit of a product from origins O1,O2,O3,O4 to destinations D1,D2,D3,D4 and D5. The capacities of the four origins are respectively 55,45,30,50 while the requirements of the five destinations are respectively 40,20,50,30,40 employing the vogel's approximations method. Make the initial to the origin to satisfy the requirement of the destinations and test the optimality of these allocations. Use Modified Distributions method (MODI) for obtaining optimal solutions also, find the total cost implied by the solution. **07**

Origin	D1	D2	D3	D4	D5	CAPACITY
O1	12	4	9	5	9	55
O2	8	1	6	6	7	45
O3	1	12	4	7	7	30
O4	10	15	6	9	1	50
REQUIREMENT	40	20	50	30	40	

Q.2 (a) Use the Graphical Method to solve the following LP problem. **07**

$$\text{Minimize } Z = -X_1 + 2X_2$$

Subject to the Constraints

- 1) $-X_1 + 3X_2 \leq 10$
- 2) $X_1 + X_2 \leq 6$
- 3) $X_1 - X_2 \leq 2$ and $X_1, X_2 \geq 0$

- (b)** ABC printing company is facing a tight financially squeeze and is attempting to cut cost, wherever possible. At present it has only one printing contract and, luckily the book is selling well in both to hardcover and the paperback edition. It has just receive a request to print more copies of this book in either the hardcover or the paperback form. The printing cost for the hardcover book is Rs 600 per 100 books while that for paperback is only Rs 500 per 100. Although the company is attempting to economize, it does not wish to lay off any employee. Therefore, it feels obliged to run its two printing presses 1 and 2. At least 80 and 60 hours per week, respectively. press 1 can produce 100 hardcover books in 2 hours or 100 paperback books in 1 hour. Press 2 can produce 100 hardcover books in 1 hour or 100 paperback books in 2 hours. Determine how many books of each type should be print in order to minimize cost. **07**

OR

- (b) A company makes two kind of leather belts A and B. Belt A is a Higher quality belt and belt B is a lower quality. The respective profits are Rs 4 and Rs 3 per belt. The production of each of type A requires twice as much time as a belt of type B. the company could make 1,000 belts per day. The supply of leather is sufficient for only 800 belts per day(both A and B combined) Belt A required a fancy buckles and only 400 of these are available per day. There are only 700 buckles a day available for belt B.
What should be the daily production of daily production of each type of Belts?
Formulate a LP and solve it using Simplex method:

- Q.3 (a)** Determine an initial basic solution to the following transportation – problem by using (a) NWCR (b) LCM (c) VAM 07

	D1	D2	D3	D4	SUPPLY
S1	21	16	15	3	11
S2	17	18	14	23	33
S3	32	27	18	41	19
DEMAND	6	10	12	15	

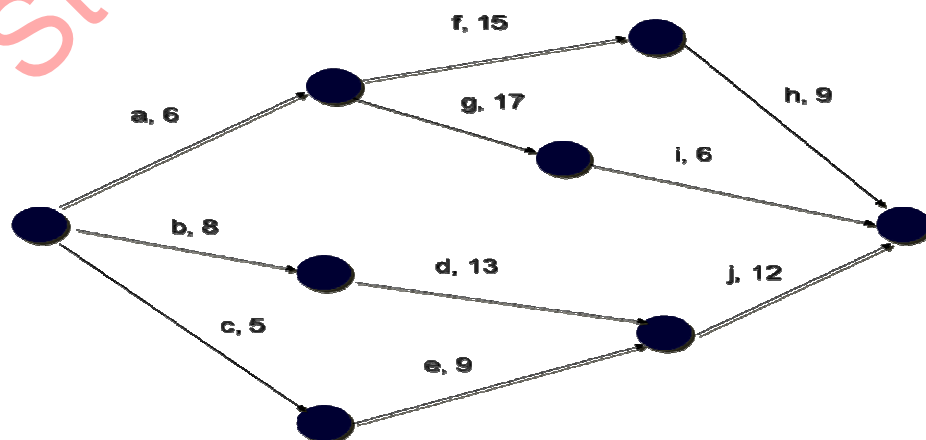
- (b) The following is the information that concerns the operations of the XYZ manufacturing company the productions cost of the company is estimated to be Rs . 5 per unit . 07

	Month 1	Month2
Units on order	800	1400
Production capacity		
Regular time	920	920
Over time	250	250
Excess cost/unit (Over time)	1.25	1.25
Storage cost / unit	0.50	0.50

Formulate and solve the above problem as transportations problem

OR

- Q.3 (a)** For the below network diagram. 07
(i) calculate earliest start, earliest finish, latest start, latest finish times for all activities,
(ii) Tabulate total float and free float



(b) Base of PERT Resulting Information is given below :

07

(i) Draw Pert Network.

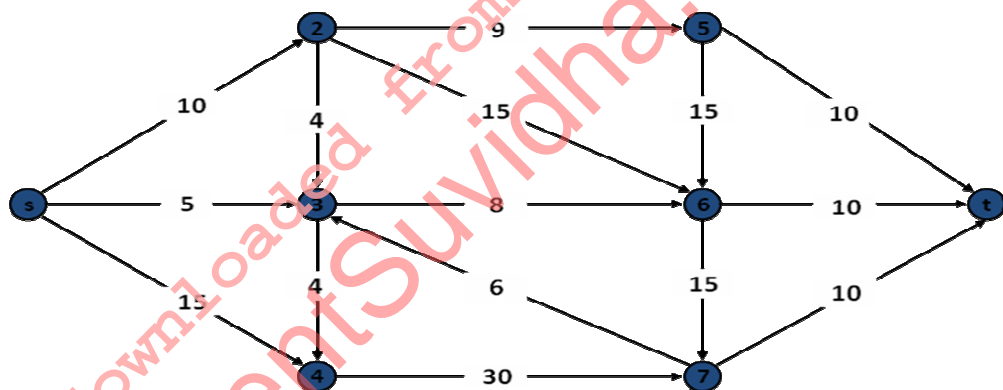
(ii) Calculate expectime and Variance.

(iii) The Contract Specifies a Rs. 5000 per day penalty for each day the completion of the project extends beyond 37 days . what is the Probability that this company will have to pay a maximum penalty of Rs. 15000?

		Immed.	Optimistic	Most Likely	Pessimistic
Activity	Predec.	Time (Hr.)	Time (Hr.)	Time (Hr.)	Time (Hr.)
A	--	2	3	4	
B	--	8	8	8	
C	A	7	9	11	
D	B	6	6	6	
E	C	9	10	11	
F	C	10	14	14	
G	C,D	11	11	11	
H	F,G	6	10	10	
I	E	4	5	5	
J	I	3	4	4	
K	H	1	1	1	

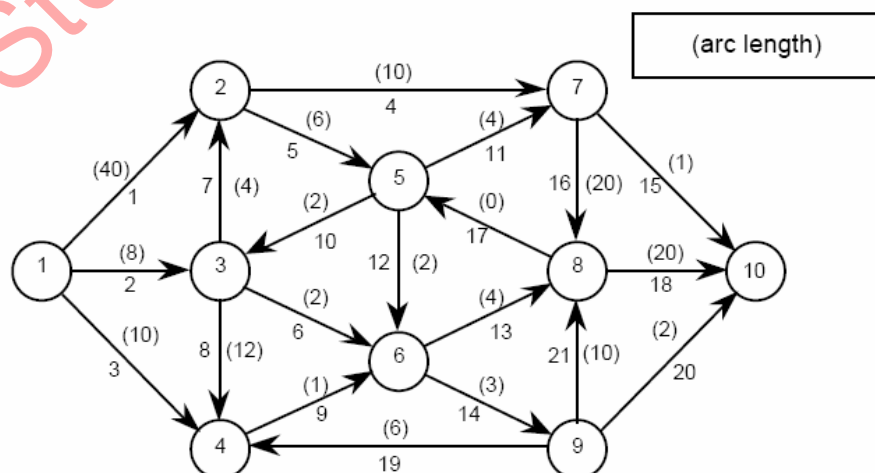
Q.4 (a) Find the Maximum Flow from s to t .

07



(b) Find the Shortest path for the given network below, Where “()” indicates arc length values.

07



OR

- Q.4 (a)** Do the Resource Allocation process for a project consisting of several activities, duration, required resource of carrying out each of activities and their availabilities as given below. **07**

Activities	Equipment	Operators	Duration(days)
1-2	X	30	4
1-3	Y	20	3
1-4	Z	20	6
2-4	X	30	4
2-5	Z	20	8
3-4	Y	20	4
3-5	Y	20	4
4-5	X	30	6

- (b)** What are the steps of the Simulation Process? Explain with Diagram also; give the advantages and disadvantages of same. **07**

- Q.5 (a)** What is the queuing theory? What are the components of the Basic Queuing Process, explain Arrival Process with example. **07**

- (b)** At a certain petrol pump, customers arrive in a Poisson process with an average time of 5 minutes between successive arrivals. The time taken at the petrol pump to serve the customers follows exponential distribution with an average of the 2 minutes.

Calculate

- Arrival and Service rate.
- The utilization parameter.
- Probability that there shall be four customers in the system.
- Probability that there are more than four customers in the system.

OR

- Q.5 (a)** Define with diagram: Birth Process & Death Process. Explain the characteristics of a queuing model. **07**

- (b)** If on an average 10 customers join a queue in one hour and the average service time per customers is 6 minutes, then the average waiting time of new arrival in single server queuing is one hour. **07**

Answer whether the statement is True, False or can't say with proper justification.
