

B.E. DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2009)

Sixth Semester

GSS108: OPERATIONS RESEARCH

(Common to CSE/FT)

Time: Three Hours

Maximum Marks: 100

**Answer all the Questions:-
PART A (10 x 1 = 10 Marks)**

- A linear programming problem is shown below:
Maximize $3x + 7y$
Subject to $3x + 7y \leq 10$
 $4x + 6y \leq 8$
 $x, y \geq 0$
It has
a) infinite optimal solutions b) exactly one optimal solution
c) infeasible solution d) an unbounded solution
- If m is the number of constraints in a LPP with two variables x and y are non-negativity constraints $x > 0, y > 0$; the feasible region in the graphical solution will be surrounded by how many lines?
a) m b) $m + 2$
c) $m + 1$ d) $m + 4$
- In a transportation problem, the materials are transported from 3 plants to 5 warehouses. The basic feasible solution can have which one of the following allocated cells?
a) 3 b) 5
c) 7 d) 8
- In a $n \times n$ matrix of an assignment problem, the optimality is reached when the minimum number of straight line scoring all the zeros is
a) n^2 b) $1/n$
c) n d) 1
- In PERT network, the distribution of the project completion time is assumed to follow
a) Poisson distribution b) Normal distribution
c) Beta distribution d) Exponential distribution
- A PERT activity has an optimistic time of 3 days, pessimistic time of 15 days and the expected time of 7 days. The most likely time of the activity is
a) 5 days b) 6 days
c) 7 days d) 9 days
- Group replacement policy is mainly suitable for
a) Cars b) lathe
c) low cost electronic components d) milling machines
- The order in which different jobs are being taken up in a machine or process is called
a) routing b) scheduling
c) sequencing d) aggregate planning
- Customers arrive at a ticket counter at a rate of 50 per hour and tickets are issued in the order of their arrival. The average time taken for issuing a ticket is 1 min. Assuming that the customer

22. a) Solve the following transportation problem for minimum transportation cost.

Factory	Ware house				Supply
	A	B	C	D	
P	2	3	11	7	6
Q	1	0	6	1	1
R	5	8	15	9	10
Requirement	7	5	3	2	

(OR)

- b) A company has 5 jobs to be done. The following matrix shows the return in rupees on assigning i^{th} ($i = 1, 2, 3, 4, 5$) machine to the j^{th} job ($j = A, B, C, D, E$). Assign the five jobs to the five machines so as to maximize the total expected profit.

		Jobs				
		A	B	C	D	E
Machines	1	5	11	10	12	4
	2	2	4	6	3	5
	3	3	12	5	14	6
	4	6	14	4	11	7
	5	7	9	8	12	5

23. a) Determine the maximal flow and the optimum flow in each arc for the network in fig.1 shown below.

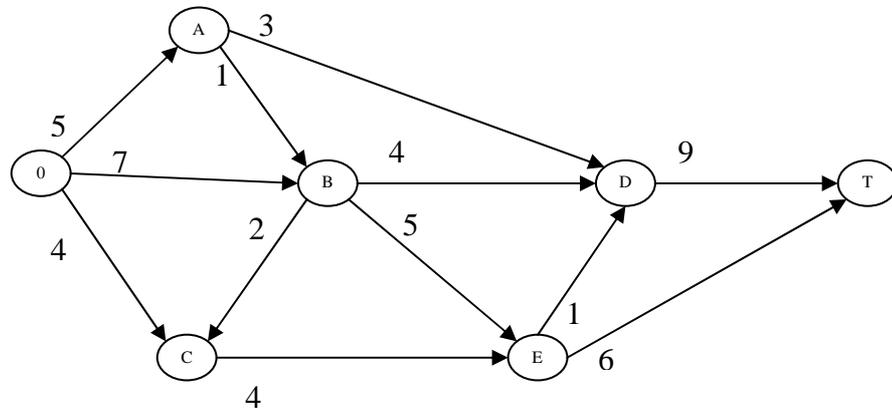


Fig.1

(OR)

- b) A small project is composed of seven activities whose time estimations are listed in the table as follows:

Activity	Optimistic time	Most likely time	Pessimistic time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

- (i) Draw the network and find expected duration and variance of each activity.
- (ii) Calculate early and late occurrence times for each node. What is the expected project length?
- (iii) Calculate the variance and standard deviation of project length. What is the probability that the project will be completed:
 - a. at least 4 weeks earlier than expected.
 - b. Not more than 4 weeks than expected.
- (iv) What due date has about a 90% chance of being met?

24. a) An electronic equipment contains 1000 resistors. When any resistor fails, it is replaced. The cost of replacing a resistor individually is Rs.8. If all the resistors are replaced at the same time; the cost per resistor is Rs.2. The percent surviving, $S(i)$ at the end of month 'i' is given below.

i:	0	1	2	3	4	5	6
S(i):	100	96	89	68	37	13	0

What is the optimum replacement plan?

(OR)

- b) Determine the optimal sequence and the total elapsed time for the jobs based on the following processing time information:

	Jobs						
	A	B	C	D	E	F	G
Machine M_1	3	8	7	4	9	8	7
Machine M_2	4	3	2	5	1	4	3
Machine M_3	6	7	5	11	5	6	12

25. a) Arrivals at a telephone booth are considered to be Poisson, with an average time of 9 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponential, with mean 3 minutes.
- (i) What is the probability that a person arriving at the booth will have to wait?
 - (ii) The telephone department will install a second booth when convinced that an arrival would expect waiting for at least 4 minutes for phone. By how much should the flow of arrivals increase in order to justify a second booth?
 - (iii) Find the average number of units in the system.
 - (iv) Estimate the fraction of a day that the phone will be in use.
 - (v) What is the probability that it will take him more than 10 minutes altogether to wait for phone and complete his call?

(OR)

- b) Ships arrive at a port at the rate of one in every 4 hours with exponential distribution of inter arrival times. The time a ship occupies a berth for unloading has exponential distribution with an average of 10 hours. If the average delay of ships waiting for berths is to be kept below 14 hours, how many berths should be provided at the port?
