

**B.E. / B.TECH DEGREE EXAMINATIONS: JUNE/JULY 2013**

Fifth Semester

**GSS108: OPERATION RESEARCH**

(Common to Mechanical Engineering and Textile Technology)

**Time: Three Hours**

**Maximum Marks: 100**

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

1. Operations Research provides
  - a) Earliest solution
  - b) Feasible solutions
  - c) Scientific approach to solutions
  - d) Statistical approach to solutions
2. Optimal solution always occurs
  - a) Within the feasible region
  - b) On the boundaries of feasible region
  - c) At corner points of feasible region
  - d) Anywhere
3. Assignment problem can be solved by
  - a) Johnson's method
  - b) method of enumeration
  - c) Hungarian method
  - d) the MODI method
4. The objective function in Transportation Problem is
  - a) Maximized
  - b) Minimized
  - c) Optimized
  - d) Well allocated
5. Which of these is not correct
  - a) PERT is probabilistic in nature
  - b) CPM is deterministic in nature
  - c) CPM and PERT use similar terminology but were developed independently.
  - d) CPM is event-oriented.
6. The average time of Optimistic time  $t_o$ , Most Probable time  $t_m$  and Pessimistic time  $t_p$  is
  - a)  $(t_p + 4t_o + t_m) / 6$
  - b)  $(t_o + 4t_p + t_m) / 6$
  - c)  $(t_o + 4t_m + t_p) / 6$
  - d)  $(t_p + 4t_o + t_m) / 4$
7. In case of equipment which deteriorates with time, as the equipment ages,
  - a) Its salvage value increases
  - b) Its operation cost decreases
  - c) Its maintenance cost increases
  - d) Cost of replacement decreases
8. A job is assigned to
  - a) Only one machine
  - b) n –number of machines
  - c) Only two machines
  - d) Only three machines
9. Queuing theory establishes balance between
  - a) Customer and service
  - b) Resources and facilities
  - c) Cost and time
  - d) Customers waiting time and service capability



- b) Solve the assignment problem for maximization given the profit matrix (profit in Rs.) using Hungarian method.

Job	Machines				
	1	2	3	4	5
A	10	12	15	12	8
B	7	16	14	14	11
C	13	14	7	9	9
D	12	10	11	13	10
E	8	13	15	11	15

23. a) Construct the network for the project whose activities and the three estimates of these activities (in weeks) are given below. Compute a) expected duration of each activity (b) expected variance of each activity (c) the critical path and the expected project completion length.

Activity	1-3	2-3	2-4	3-5	4-5	4-6	5-7	6-7	7-8	7-9	8-10	9-10
a	3	1	2	3	1	3	4	6	2	1	4	3
m	4	2	3	4	3	5	5	7	4	2	6	5
b	5	3	4	5	5	7	6	8	6	3	8	7

(OR)

- b) The following time-cost table (time in weeks and cost in Rs.) applies to a project. If the indirect cost per week is Rs.300. Find the optimal crashed project completion time.

Activity	Normal		Crash	
	Time	Cost	Time	Cost
1-2	8	800	5	950
1-3	5	500	3	700
1-4	9	600	6	1050
2-5	10	900	8	1300
3-5	5	700	3	1100
3-6	6	1200	5	1500
4-6	7	1300	5	1400
5-7	2	400	1	500
6-7	4	500	3	900

24. a) A firm is considering replacement of a machine, whose cost price is Rs.12,200, and the scrap value is Rs.200. The running (maintenance and operating) costs in Rs. are found from experience to be as follows:

Year	1	2	3	4	5	6	7	8
Running Cost	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

(OR)

- b) We have five jobs, each of which must go through the machines A, B and C in the order A-B-C. The processing times (in hours) are as follows.

Machine	Job				
	I	II	III	IV	V

A	4	3	8	6	5
B	5	6	2	3	4
C	8	10	6	7	11

- (a) Determine the optimal sequence.  
 (b) What will be the total elapsed time? and  
 (c) What will be the idle time of each of the three machines?

25. a) (i) A T.V. repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in and if the arrival of sets is approximately Poisson, with an average rate of 10 per 8 hour day, what is the repairman's idle time each day? How many jobs are ahead of the average set brought in?
- (ii) A super market has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes and if people arrive in a Poisson fashion at the counter at the rate of 10 per hour, then calculate
- (a) The probability of having to wait for service.  
 (b) the expected percentage of idle time for each girl.  
 (c) If a customer has to wait find the expected length of his waiting time

**(OR)**

- b) (i) Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially, with mean 3 minutes.
- a) What is the probability that a person arriving at the booth will have to wait?  
 b) What is the average length of the queue that forms from time to time?  
 c) The telephone department will install a second booth when convinced that an arrival would have to wait for at least 3 minutes for phone. By how much should the flow of arrivals increase in order to justify a second booth?  
 d) What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free?  
 e) What is the probability that he will have to wait for more than 10 minutes before the phone is available and the call is also complete.  
 f) Find the fraction of a day that the phone will be in use.
- (ii) An automatic car wash facility operates with only one bay. Cars arrive according to a Poisson distribution with a mean of 4 cars / hr. and may wait in the facility's parking lot if the bay is busy. Find  $L_s, L_q, W_s, W_q$ , if the service time.
- i) is constant and equal to 10 minutes.  
 ii) follows uniform distribution between 8 and 12 minutes.  
 iii) follows normal distribution with mean 12 minutes and S.D. 3 minutes.  
 iv) follows a discrete distribution with values 4, 8 and 15 minutes with corresponding probabilities 0.2, 0.6 and 0.2.

\*\*\*\*\*