DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

B. Tech. (Mechanical) (Semester – V) Elective II

Supplementary Winter Semester Examination December 2019

Sub.: Quantitative Techniques in Project Management (QTPM) **Time: 03 Hours**
Max. Marks: 70

Instructions to the Student:

1. Question No. 1 is compulsory.
2. All questions are compulsory. However, there are internal choice among them.
3. Clearly mention the main question number along with the sub questions.

Que. 1: Select the right choice from the given answers 10

1. The person who coined the name Operations Research is:----------
(a) Bellman, (b) Newman,
(c) McClosky and Trefrhen, None of the above

2. In Graphical solution of maximisation problem, the line, which we move from origin to the extreme point of the polygon is:
(a) Any one side of the polygon, (b) Iso cost line,
(c) Iso profit line, (d) An imaginary line,

3. To balance the assignment matrix we have to:
(a) Open a Dummy row, (b) Open a Dummy column,
(c) Open either a dummy row or column depending on the situation, (d) You cannot balance the assignment matrix.

4. In the optimal solution, more than one empty cells have their opportunity cost as zero, it Indicates ----------
(a) The solution is not optimal; (b) The problem has alternate solution,
(c) Something wrong in the solution, (d) The problem will cycle,

5. Which of the following maintenance policies is not used in old age stage of a machine?
(a) Operate up to failure and do corrective maintenance, (b) Reconditioning,
(c) Replacement, (d) Scheduled preventive maintenance

6. A machine is replaced with average running cost ----------
(a) Is not equal to current running cost, (b) Till current period is greater than that of next period,
(c) If current period is greater than that of next period, (d) If current period is less than that of next period.

7. Procurement cost may be clubbed with:
(a) Inventory carrying charges, (b) Stock out cost,
(c) Loss due to deterioration, (d) Ordering cost.

8. Which of the following increases with quantity ordered per order?
(a) Carrying cost (b) Ordering cost,
(c) Purchase cost (d) Demand

9. When a doctor attends to an emergency case leaving his regular service is called:
(a) Regening (b) Balking
(c) Pre-emptive queue discipline, (d) Non-Pre-Emptive queue discipline.

10. Choose the wrong statement.
(a) PERT is probabilistic in nature (b) CPM is deterministic in nature
(c) CPM is event oriented (d) CPM and PERT use similar terminology but were developed independently

Que. 2 Solve the following:

(a) A company manufactures two products X and Y. The profit contribution of X and Y are Rs.3/- and Rs. 4/- respectively. The products X and Y require the services of four facilities. The capacities of the four facilities A, B, C, and D are limited and the available capacities in hours are 200 Hrs, 150 Hrs, and 100 Hrs. and 80 hours respectively. Product X requires 5, 3, 5 and 8 hours of facilities A, B, C and D respectively. Similarly the requirement of product Y is 4, 5, 5, and 4 hours respectively on A, B, C and D. Find the optimal product mix to maximise the profit.

Machines	Products		Availability in Hrs
Machines	X (Time in Hrs)	Y (Time in Hrs)	
A	5	4	200
B	3	5	150
C	5	4	100
D	8	4	80
Profit in Rs. Per unit	3	4	

Formulate the linear programming problem (model) specifying the product mix which will maximize the profit without exceeding the levels of resources. 8

(b) Explain the terms: Opportunity cost, Key column, Key row and Key number 4

Que. 3. Solve the following:

(a) What are the similarities and differences between the transportation model and the Assignment models. List any two each. 4

(b) A company has a current shipping schedule, which is being questioned by the management as to whether or not it is optimal. The firm has three factories and five warehouses. The necessary data in terms of transportation costs in Rs. per unit from a factory to a destination and factory capacities and warehouse requirements are as follows. Solve for an optimal shipping schedule in terms of lowest possible shipping costs. Use NWCM and MODI method. 8

	Factories (Transportation cost in Rs. Per unit)			
Warehouse	X	Y	Z	Requirement of warehouses in units.
A	5	4	8	400
B	8	7	4	400
C	6	7	6	500
D	6	6	6	400
E	3	5	4	800
Factory capacities	800	600	1100	

Que. 4 Solve the following

(a) A branch of a Nationalized bank has only one typist. Since typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with a mean service rate of 8 letters per hour. The letter arrives at a rate of 5 per hour

during the entire 8-hour workday. If the typist is valued at Rs. 1.50 per hour, determine: (a) Equipment utilization, (b) The percent time an arriving letter has to wait, (c) Average system time, and d) Average idle time cost of the typewriter per day. 8

(b) Explain with suitable examples about the queue. Why do you consider the study of waiting line as an important aspect? 4

Que. 5 Solve any two of the following:

(a) Explain the EOQ model for purchased item with shortage cost. 6

(b) A company uses to order a new machine after a certain fixed time. It is observed that one of the parts of the machine is very expensive if it is ordered without machine and is Rs. 500/-. The cost of down time of machine and the cost of arranging the part is Rs. 10000/-. From the previous records it is observed that spare part is required with the probabilities as shown below:

Demand = r =	*0*	*1*	*2*	*3*	*4*	*5*	*6 or > 6*
Probability p (*r*) =	0.90	0.05	0.02	0.01	0.01	0.01	0.00

Find the optimum number of spare parts, which should be ordered with the order of machine. 6

(c) A company uses annually 24,000 units of raw material, which costs Rs.1.25 per unit. Placing each order costs Rs. 22.50 and the carrying cost is 5.4% per year of the average inventory. Find the economic lot size and the total inventory cost including material cost. Suppose, the company is offered a discount of 5% by the supplier on the cost price of single order of 24,000 units, should the company accept? 6

Que. 6 Solve the following:

(a) Differentiate between the PERT and CPM. 3

(b) A project consists of 9 activities and the three-time estimates are given below. Find the project
(c) completion time (TE). 9

Activities		Days		
i	j	T_O	T_L	T_P
10	20	5	12	17
10	30	8	10	13
10	40	9	11	12
20	30	5	8	9
20	50	9	11	13
40	60	14	18	22
30	70	21	25	30
60	70	8	13	17
60	80	14	17	21
70	80	6	9	12

OR

Que. 6 (i) Explain in brief the Fulkerson rule of node numbering and network diagram? 3

(ii) A time estimate in weeks for the activities of a PERT network are given below:

Activity	t_o	t_m	t_p
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 project network and identify all the paths through it.
(ii) Determine the expected project length
(iii) Calculate the standard deviation and variance of the project length.