B.E./B.TECH. Degree Examination, September 2020

Semester – VIII

ME16016 – Operations Research

(Regulation 2016)

Time: Three hours Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. Operations Research uses models built by_____ measurement of the variables concerning a given problem and also derives a solution from the model using _____ of the diversified solution techniques
   a. Qualitative, two or more
   b. Quantitative , one or more
   c. Qualitative , three or more
   d. Quantitative , only one

2. If supply is not equal to demand, the problem is called as _____
   a. Assignment problem
   b. Balanced Transportation problem
   c. Optimization Problem
   d. Unbalanced Transportation Problem

3. What can be defined as a useful idle resource which has economic value eg; raw materials, spare parts, finished items, etc?
   a. Inventory Control
   b. Inventory
   c. Inventory Planning
   d. None of the above

4. The Operations Research technique which helps in minimizing total waiting and service costs is
   a. Decision theory
   b. Queuing theory
   c. Both A and B
   d. None of the above

5. Write the dual of given primal LP problem
   Min $Z = X_1 + X_2 + X_3$

Subject to constraints

$X_1 - 3X_2 + 4X_3 = 5$

$X_1 - 2X_2 \leq 3$

$2X_2 - X_3 \geq 4$; X_1 and $X_2 \geq 0$ and X_3 is unrestricted

6. A system in Operations Research follows arrival and service pattern. List some characteristics of that system which differentiates it from others.
7. A tool is used to determine the volume and frequency of orders required to satisfy a given level of demand while minimizing the cost per order. Mention the significance of the tool and explain it.
8. Optimality of any feasible solution requires allocations in m + n - 1 independent cell. In cases when number of allocations is short of required number one, what it is called? List its consequences and ways to overcome.

PART B - (4 X16 = 64 marks)**

09. (a) (i) Solve the following linear programming problem using appropriate method. **(16)**

Maximize $Z = 100X_1 + 80X_2$

$6X_1 + 12X_2 \leq 55$

$8X_1 + 2X_2 \geq 16$

$4X_1 - 3X_2 \geq 5$; X_1 and $X_2 \geq 0$

(OR)

(b) (i) Solve the following linear programming problem using the result of its dual problem **(16)**

Maximize $Z = 26X_1 + 32X_2$

$3X_1 + 4X_2 \geq 10$

$5X_1 + 10X_2 \geq 16$

$6X_1 + 6X_2 \geq 20$; X_1 and $X_2 \geq 0$

10. (a) (i) Obtain the basic feasible solution using northwest corner cell method and then optimize the solution using MODI method. The cell entries. **(16)**

Destination

Source	1	2	3	4	Supply
1	3	2	7	4	320
2	1	6	5	9	420
3	7	3	4	2	520
Demand	200	300	450	250	

(OR)

(b) (i) A project is composed of seven activities whose time estimates are given below. Draw the network and find the project completion time **(16)**

Activity	Preceding activity	Duration
A	--	5
B	--	8

C	--	7
D	A,B	6
E	A,B	9
F	C,D,E	7
G	C,D,E	6

11. (a) (i) Annual demand for an item is 11000 units. Ordering cost is Rs 12/order. Inventory cost is Rs 6/unit/year. Unit price is Rs 25/unit. Shortage cost is Rs 7/unit/year. Find optimum order quantity, optimum shortages, maximum inventory and total cost. Would you recommend back ordering considering the total cost when back ordering is not allowed? **(16)**

(OR)

(b) (i) Annual demand for an item is Rs 12,000 per year. Ordering cost is Rs 20 per order. Holding cost is 16% of the price/unit/year. Price breaks are given below. Find (i) EOQ and (ii) If ordering cost is changed to Rs30/order, find revised EOQ. **(16)**

Order Size	**Cost/unit**
< 2500	5
2500 – 3999	3.2
4000 or more	3.95

12. (a) (i) In NH7 connecting Varanasi and Kanyakumari, there exists a famous drive-in restaurant that gets more than 500 customers in a single day. They find a greater difficulty in allotting parking space for vehicles where vehicles arrive with a mean arrival rate of 23 cars per hour and the service rate of the cars is 18 cars per hour. The arrival rate and service rate follow Poisson distribution. The number of parking space for cars is only 5. Find the standard results of this system. **(16)**

(OR)

(b) (i) Solve the following nonlinear programming problem using lagrangean method. **(16)**

Minimize $Z = X_1^2 + X_2^2 + X_3^2$

Subject to $X_1 + X_2 + 3X_3 = 4$

$6X_1 + 3X_2 + X_3 = 7$

X_1 , X_2 and $X_3 \geq 0$

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