

C.U.SHAH UNIVERSITY

Winter Examination-2019

Subject Name: Operation Research

Subject Code: 4TE07ORE1

Branch: B.Tech (Mechanical)

Semester: 7

Date : 26/11/2019

Time : 10:30 To 01:30

Marks : 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1

Attempt the following questions:

(14)

- a) Operations Research (OR) , which is a very powerful tool for _____
a) Research b) Decision – Making c) Operations d) None of the above
- b) Which of the following is not associated with any LPP?
a) Feasible solution b) optimum solution c) Basic solution d) Quadratic equation.
- c) This innovative science of Operations Research was discovered during _____
a) Civil War b) World War I c) World War II d) Industrial Revolution
- d) What aims at optimizing inventory levels?
a) Inventory Control b) Inventory Capacity c) Inventory Plan d) None of above
- e) Operations Research study generally involves how many phases?
a) Three b) Four c) Five d) Two
- f) In simplex method ,we add _____ variables in the case of ‘=
a) Slack Variable b) Surplus Variable c) Artificial Variable d) None of the above
- g) Operations Research attempts to find the best and _____ solution to a problem
a) Optimum b) Perfect c) Degenerate d) None of the above
- h) VAM stands for
a) Vogea’s Approximation Method b) Vogel’s Approximate Method
c) Vangel’s Approximation Method d) Vogel’s Approximation Method
- i) If there are ‘m’ original variables and ‘n’ introduced variables, then there will be _____ columns in the simplex table
a) $M + n$ b) $M - n$ c) $3 + m + n$ d) $M + n - 1$
- j) A dummy activity in a net work diagram
a) Is represented by a dotted line b) Does not consume time or resources
c) Is an artificial activity d) All of these
- k) Replacement Model is a _____ model
a) Static Models b) Dynamic Models c) Both A and B d) None of the above
- l) The passenger and the train in queuing system describers
a) Customer and server b) Both server
c) Server and customer d) none of these
- m) LP model is based on the assumptions of _____
a) Proportionality b) Additivity c) Certainty d) All of the above
- n) The method used for solving an assignment problem is called



- a) Reduced matrix method b) Hungarian method
c) Modi method d) graphical method

Attempt any four questions from Q-2 to Q-8

Q-2

Attempt all questions

- (a) What is degeneracy? How does the problem of degeneracy arise in a transportation problem? How can we deal with this problem? (07)
- (b) Company has factories A1, A2 & A3 which supply to warehouses at W1, W2 & W3. Weekly factory capacities are 240, 200 & 130 units respectively. Weekly warehouses requirements are 190, 150 & 110 units respectively. Unit transportation costs in Rs. are given in the table. Find initial basic feasible solution using VAM method & Optimum solution by MODI method. (07)

Company\Warehouse	W1	W2	W3	Supply
A1	16	20	12	240
A2	14	8	18	200
A3	26	24	16	130
Demand	190	150	110	450

Q-3

Attempt all questions

- (a) Explain the different phases of operations research in detail. (07)
- (b) Solve the following LPP by simplex method (07)
- Maximize $Z=3x_1+2x_2$
Subjected to,
1) $2x_1+x_2 \leq 40$, 2) $2x_1+3x_2 \leq 60$, 3) $x_1+x_2 \leq 24$; and $x_1, x_2 \geq 0$

Q-4

Attempt all questions

- (a) Use graphical method to solve the LPP (07)
- Max $Z=3x_1+4x_2$
Subjected to,
1) $5x_1+4x_2 \leq 200$, 2) $3x_1+5x_2 \leq 150$, 3) $5x_1+4x_2 \geq 100$, 4) $8x_1+4x_2 \geq 80$;
and $x_1, x_2 \geq 0$
- (b) A factory uses three machines to produce two machine parts. The following table represents the machining time for each part and other related information. Find the number of parts to be manufactured per week to maximize the profit. (07)

Machine	Time for machining (min.)		Max. time available per week
	Part I	Part II	
Lathe	12	6	3000
Milling	4	10	2000
Grinding	2	3	900
Profit /unit (Rs.)	40	100	

Q-5

Attempt all questions

- (a) What is an assignment problem? Why it is called as a special case of the transportation problem? (03)
- (b) Write the dual of the following Problem. (04)
- Minimize $Z = 3x_1 - x_2 + x_3$
Subject to, 1) $4x_1 - x_2 \leq 8$, 2) $8x_1 + x_2 + 3x_3 \geq 12$ 3) $5x_1 - 6x_3 \leq 13$;
and $x_1, x_2, x_3 \geq 0$;
- (c) The captain of a cricket team has to allot five middle order batting positions to 5 (07)



batsmen available for selection.

Batsman	Batting positions				
	I	II	III	IV	V
A	40	46	48	36	48
B	48	32	36	29	44
C	49	35	41	38	45
D	30	46	49	44	44
E	37	41	48	43	47

Using Assignment model, determine the assignment of batsmen to positions which would give maximum runs in favor of team.

Q-6

Attempt all questions

- (a) A shopkeeper has 500 units of refrigerators to be supplied per year to his customers. The demand is fixed. The inventory holding cost is Rs. 200 per unit and the ordering cost is Rs. 80. Determine: (a) Optimum lot size (b) Optimal total variable cost (c) Optimal period of order to be placed (d) Number of total orders to be placed in a year (07)
- (b) The maintenance cost and resale value per year of a machine whose purchase price is Rs.7000 is given below. When should machine be replaced? (07)

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs)	900	1200	1600	2100	2800	3700	4700	5900
Resale value cost (Rs)	4000	2000	1200	600	500	400	400	400

Q-7

Attempt all questions

- (a) Write a short note on “ABC analysis” of inventory control technique (07)
- (b) At barber’s shop, the customers arrive at the average interval of 6 minutes and the barber takes on an average 5 minutes for serving the person. Calculate: (07)
- Counter utilization level
 - Average no. of customers in service
 - Average no. of customers in queue
 - Average waiting time of the customers in the system
 - Expected average waiting time in the queue
 - Probability that the barber is idle
 - Probability of finding more than 3 customers in the system

Q-8

Attempt all questions

- (a) (i) Define: Event, Dummy activity, Free float. (ii) Differentiate CPM & PERT (07)
- (b) The details of activity and duration are shown below: (07)

Activity	A	B	C	D	E	F	G
Depends on	-	A	A	A	B,C	C,D	E,F
Time, Days	10	5	4	7	6	4	7

Find: 1) Draw a network diagram 2) Find the critical path 3) Project duration

