

SITE21

08.05.2024(10.00AM-01.00PM)

VI Sem B.Tech Regular Examinations**Operation Research**

Subject Code: 21CE/CS/CTMEO605A

Time: 3 hours**Max. Marks: 70****Instructions:** Answer all the questions, each question carries 14 marks.

- 1 a Solve graphically the given linear programming problem. (Minimization Problem). K2 CO1 7M
Minimize $Z = 3a + 5b$, Subject to
 $-3a + 4b \leq 12$
 $2a - 1b \geq -2$
 $2a + 3b \geq 12$
 $1a + 0b \geq 4$
 $0a + 1b \geq 2$
And both a and b are ≥ 0 .

- b A company manufactures two products, X and Y by using three machines A, B, and C. Machine A has 4 hours of capacity available during the coming week. Similarly, the available capacity of machines B and C during the coming week is 24 hours and 35 hours respectively. One unit of product X requires one hour of Machine A, 3 hours of machine B and 10 hours of machine C. Similarly, one unit of product Y requires 1 hour, 8 hour and 7 hours of machine A, B and C respectively. When one unit of X is sold in the market, it yields a profit of Rs. 5/- per product and that of Y is Rs. 7/- per unit. Solve the problem by using graphical method to find the optimal product mix. K2 CO1 7M

OR

- 2 a Briefly explain the applications of Operation Research. K2 CO1 7M
b Minimize $Z = x_1 - 3x_2 + 2x_3$, K2 CO1 7M
Subject to: $3x_1 - x_2 + 3x_3 \leq 7$
 $-2x_1 + 4x_2 \leq 12$
 $-4x_1 + 3x_2 + 8x_3 \leq 10$, and $x_1, x_2, x_3 \geq 0$ Solve the problem by using graphical method.

- 3 Solve the following L.P.P. using Big- M Method K2 CO2 14M
Maximize $Z = 1a + 2b + 3c - 1d$ Subject to
 $1a + 2b + 3c = 15$
 $2a + 1b + 5c = 20$
 $1a + 2b + 1c + 1f = 10$ and a, b, c, f all are ≥ 0

OR

- 4 a By using two phase method find whether the following problem has a feasible solution or not? K3 CO2 7M

Maximize $Z = 4a + 5b$ subject to Simplex version is: Max. $Z = 4a + 5b + 0S_1 + 0S_2 - MA$ s.t.

$$2a + 4b \leq 8$$

$$2a + 4b + 1S_1 + 0S_2 + 0A = 8$$

$$1a + 3b \geq 9 \text{ and both } a \text{ and } b \text{ are } \geq 0; \quad 1a + 3b + 0S_1 - 1S_2 + 1A = 9 \text{ and}$$

$$a, b, S_1, S_2, A \text{ all are } \geq 0$$

- b Use dual simplex method for solving the given problem. K3 CO2 7M
 Maximize $Z = 2a - 2b - 4c$ s.t
 $2a + 3b + 5c \geq 2$
 $3a + 1b + 7c \leq 3$
 $1a + 4b + 6c \leq 5$ and a, b, c all ≥ 0

- 5 The DREAM - DRINK Company has to work out a minimum cost transportation schedule to distribute crates of drinks from three of its factories X, Y, and Z to its three warehouses A, B, and C. The required particulars are given below. Find the least cost transportation schedule. Transportation cost in Rs per crate. K3 CO3 14M

From / To	A	B	C	Crates available.
X	75	50	50	1040
Y	50	25	75	975
Z	25	125	25	715
Crates required	1300	910	520	2730

OR

- 6 a Explain briefly the procedure adopted in assignment algorithm. K3 CO3 7M
 b What do you mean by balancing an assignment problem? What steps you take to solve maximization case in assignment problem? Explain. K3 CO3 7M
- 7 a Find the optimal sequence and total elapsed time for processing two jobs on 5 machines by graphical method. K3 CO4 7M

Job 1:	Time in hours:	2	3	4	6	2
	Order of machining:	A	B	C	D	E
Job2:	Time in hours:	4	5	3	2	6
	Order of machining:	B	C	A	D	E

- b Explain the assumption made in solving sequencing problem. K3 CO4 7M

OR

- 8 a The initial cost of a machine is Rs. 6100/- and its scrap value is Rs.100/-. K2 CO4 7M
 The maintenance costs found from experience are as follows:

Year:	1	2	3	4	5	6	7	8
Annual maintenance cost in Rs.:	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

- b A taxi owner estimates from his past records that the costs per year for operating taxi whose purchase price when new is Rs.60000/- are as given below: K3 CO4 7M

Age (year):	1	2	3	4	5
Operating cost in Rs.:	10000	12000	15000	18000	20000

After 5 years, the operating cost is Rs. $6000 \times k$ Where $k = 6, 7, 8, 9, 10$, i.e. 'k' denotes years. If the resale value decreases by 10% of purchase price each year, what is the best replacement policy? Cost of money is zero.

- 9 a In a departmental store one cashier is there to serve the customers. And the customers pick up their needs by themselves. The arrival rate is 9 customers for every 5 minutes and the cashier can serve 10 customers in 5 minutes. Assuming Poisson arrival rate and exponential distribution for service rate, find: (a) Average number of customers in the system. (b) Average number of customers in the queue or average queue length. (c) Average time a customer spends in the system. (d) Average time a customer waits before being served. K2 CO5 7M
- b Players A and B play the following game. A has a bag containing three coins, one worth 4 units, one 6 units and the rest 9 units of money. A takes one coin from the bag and before exposure B guesses. If B is right he takes the coin and if wrong he pays to A the same worth money to A. Find the optima strategies of A and B and the value of the game. K2 CO5 7M

OR

- 10 a Repairing a certain type of machine, which breaks down in a given factory, consists of 5 basic steps that must be performed sequentially. The time taken to perform each of the 5 steps is found to have an exponential distribution with a mean of 5 minute and is independent of the other steps. If these machines breakdown in Poisson fashion at an average rate of two per hour and if there is only one repairman, what is the average idle time for each machine that has broken down? K2 CO5 7M
- b Two armies are at war. Army A has two air bases, one of which is thrice as valuable as the other. Army B can destroy an undefended air base, but it can destroy only one of them. Army A can also defend only one of them. Find the strategy for A to minimize the losses. K3 CO5 7M
