

GURU NANAK INSTITUTE OF TECHNOLOGY

Unit Test - II, Odd Semester-2021-2022

Stream : CSE-I / CSE-II
Subject : Operations Research
Time : 1:30 Hour

Semester : 5th.
Paper Code : CS505A
Marks : 5 + 30

Group-A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any five of the following : 5 x 1 = 5

- i If a variable x_i is unrestricted in sign in a primal L.P.P., then the corresponding dual i^{th} constraint in the dual problem will be
a) \geq type b) \leq type c) equality constraint d) none of these
- ii In a $(M/M/1 : \infty / FIFO)$ queue model with arrival and service rate λ and μ ($\lambda < \mu$) respectively, then the 'Average length of a non-empty queue $[E(m/m>0)]$ is given by
a) $\lambda^2 / (\mu(\mu - \lambda))$ b) $\mu / (\mu - \lambda)$ c) $\lambda\mu / (\mu - \lambda)^2$ d) none of these
- iii If some constant is added to each cost C_{ij} of the assignment matrix then the
a) optimal solution changes b) optimal solution remains same
c) optimal solution does not exist d) none of these
- iv For two person game with A and B, the minimizing and maximizing players, the optimum strategies are :
a) Minimax for A and Maximin for B b) Maximax for A and Minimax for B
c) Minimin for A and Maximin for B d) Maximin for A and Minimax for B
- v In a simple deterministic EOQ model, with constant demand rate (D) and infinite rate of production, the economic lot size is
a) $\sqrt{2K/Dh}$ b) $\sqrt{2/KDh}$ c) $\sqrt{2KDh}$ d) $\sqrt{2KD/h}$
- vi The amount of time by which an activity can be delayed, if all its preceding activities take place at their earliest possible time and the following activities are allowed to wait until their latest permissible time, is called
a) activity float b) total float c) free float d) independent float
- vii The solution of transportation problem with m sources and n destinations is feasible if the number of allocations are
a) $m + n - 1$ b) $m + n + 1$
c) $m + n$ d) $m \times n$
- viii If there were 'n' workers and 'n' jobs, there would be
a) n solutions b) n! solutions c) (n-1)! solutions d) n^n solutions
- ix. What is the fractional part of $-\frac{2}{3}$?
a) $\frac{1}{3}$ b) $-\frac{1}{3}$ c) $\frac{2}{3}$ d) $\frac{1}{2}$

Group-B

(Short Answer Type Question)

Answer any four (4) of the following questions

4 X 7.5 = 30

- 2 Find the optimal solution of the L.P.P by Simplex method

$$\text{Minimize } Z = 10x_1 + 5x_2$$

$$\text{Subject to } x_1 + 2x_2 \geq 2$$

$$3x_1 + x_2 \geq 3$$

$$\text{and } x_1, x_2 \geq 0$$

[Duality can be use to solve the above L.P.P.]

3. Solve the following assignment problem using Hungarian method:

Machines →

JOBS	M ₁	M ₂	M ₃	M ₄
J ₁	10	5	13	15
J ₂	3	9	18	3
J ₃	10	7	3	2
J ₄	5	11	9	7

4. a) Define convex set with example. Prove that intersection of two convex sets is a convex set.

b) Show that $X = \{(x_1, x_2) : x_1^2 + x_2^2 = 16\}$ is not a convex set.

5. A self-service store employs one cashier at its counter. Nine customers arrive on an average of every five minutes while the cashier can serve 10 customers in every 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for service rate, find

- i) average number of customer in the system
- ii) average number of customers in the queue
- iii) average time a customer spends in the system
- iv) average time a customer spends in the queue.

6. An oil engine manufacturer purchases lubricants at the rate of Rs. 42 per price from a vendor. The requirement of these lubricants is 1800 per year. What should be the order quantity per order, if the cost per placement of an order is Rs. 16 and inventory carrying charge per rupee per year is only 20 paise? If the company operates 250 days a year, the procurement time is 124 day and safety stock is 100 unit, find re-order level, maximum, minimum and average inventory.

7. Find the dual of the following problem:

$$\text{Minimize } Z = x_1 + x_2 + x_3$$

$$\text{Subject to } x_1 - 3x_2 + 4x_3 = 5$$

$$x_1 - 2x_2 \leq 3$$

$$2x_2 - x_3 \geq 4$$

$$x_1, x_2 \geq 0 \text{ and } x_3 \text{ Unrestricted in sign.}$$

Examination Date 23-12-2020, Time 10:30 AM to 11:30 AM

File name of the Scan Copy of the answer script be as RN_CSE1 / CSE2_UT2_ CS505A_ Name
['RN' your roll number , 'Name' your name]
[Roll number of CSE1 1,2,3.. as 01,02,03....]
[Roll number of CSE2 77,78,79,80.... as 077,078,079,080....]

[e.g. for roll number 2 of CSE1, file name as 02 CSE1 UT2 CS505A Abhijit Pal]

[e.g. for roll number 77 of CSE2, file name as 077 CSE2 UT2 CS505A Reshmi Das]

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CS505A: Operations Research

Question vs. CO mapping:

Question No.	CO No.	Marks allotted
A(1)	1,2,3,4	5
B(2)	2,4	7.5
B(3)	2,3	7.5
B(4)(a)	1,2,3	4.0
B(4)(b)	1,2,3	3.5
B(5)	2,3,4	7.5
B(6)	3,4	7.5
B(7)	2,3,4	7.5

COURSE OUTCOME:

On successful completion of the learning sessions of the course, the learner will be able to:

CO Specifications:

CODES	BLOOM'S TAXONOMY	DESCRIPTIONS
CS505A.1	Remember	Recall the distinctive characteristics of different types of decision-making problem to formulate and solve a real-world problem a prototype of mathematical problem.
CS505A.2	Understand	Understand the theoretical workings of appropriate decision making approaches and tools to identify the optimal strategy in competitive world.
CS505A.3	Apply	Apply the principles of different Methods/Model of Operations Research to solve practical problems.
CS505A.4	Analyze	Select appropriate Methods/Model to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources.

File name of the Scan Copy of the answer script be as RN_CSE1 / CSE2_UT2_ CS505A_ Name