Tribhuvan University

Faculty of Humanities & Social Sciences

OFFICE OF THE DEAN

2024

Bachelor in Computer Applications
Course Title: Operational Research
Code No: CAOR 451
Semester: VIII

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Candidates are required to answer the questions in their own words as far as possible.

Group B

Attempt any SIX questions. **[6×5 = 30]**

2. Describe in brief, the tools and techniques of operation research. [2.5+2.5]
3. Explain ABC inventory planning system. An auto industry purchases spark plugs at the rate of Rs 25 per piece. The annual consumption of spark plug is 18000 numbers. if the ordering cost is Rs 250 per order and carrying cost is 25% p.a., what would be the EOQ? If the supplier of spark plugs offers a discount of 5% for order quantity of 3000 numbers per order, do you accept the discount offer? [1+4]
4. Reduce the following two person zero sum game to 2x2 order by dominance rule and obtain the optimal strategies for each player and the value of the game.

Player A	Player B			
	B_1	B_2	B_3	B_4
A_1	3	2	4	0
A_2	3	4	2	4
A_3	4	2	4	0
A_4	0	4	0	8

5. A radio machine on an average finds 5 customers coming to his shop every hour for repairing their radio sets. He disposes of each of them within 10 minutes on an average. The arrival and servicing times follow Poisson and exponential distribution respectively. In the light of the above facts determine:
   a) Proportion of time during which his shop remains empty.
   b) The average no. of customers in his system and queue.
   c) The average time spent by a customer in the queue and the service as well.
   d) The probability of finding at least five customers in his shop.
6. Carew's machine shop has four machines on which three jobs have to be done. Each job can be assigned to one and only one machine. The cost (in Rs) of each job on each machine is given below:

	Machines			
Job	**P**	**Q**	**R**	**S**
A	45	60	70	80
B	20	32	42	47
C	25	37	47	55

Req: What are the job assignments which will minimize the total cost?

7. Write the meaning of duality. What are the major steps of formulating dual linear programming problems? Justify with example. [1+3+1]
8. Write short notes on. (any two) [2.5+2.5]
   a) Meaning of Degeneracy in Transportation Problem.
   b) Queuing Theory.
   c) Assignment Problem Algorithm.

Group C

Attempt any TWO questions. **[2×10 = 20]**

9. What is game theory? State the assumption underlying it. Discuss its importance to business decisions. [2+4+4]
10. Solve the following LP problems using the simplex method.

    Maximize $z = 5x_1 + 3x_2$

    Subject to Constraints

    $2x_1 + x_2 \leq 5$

    $x_1 + x_2 \leq 4$

    and

    $x_1, x_2 \geq 0$

11. Jack Evan owns several trucks used to haul crushed stone to road project iun the country. Th road contractor for whom jack hauls, N Teer, has given jack this schedule for next week:

Project	Requirement per week	Plant	Available per week
A	50	W	45
B	75	X	60
C	50	Y	60

Jack figures his cost from the crushing plant to each of the road projects to be these:

Cost information (in RS)

To /From	A	B	C
W	4	8	3
X	6	7	9
Y	8	2	5

Req: Compute Jack's optimal hauling schedule for next week and his transportation cost.