2016/ODD/08/24/CS–902 (O)/
MS–302 (C)/598

PG Odd Semester (CBCS and Old)
Exam., December—2016

COMPUTER SCIENCE

(9th Semester / 3rd Semester)

Course No. : CS–902 (O) / MS–302 (C)

(Operations Research)

Full Marks : 75
Pass Marks : 26

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Define the following : 2+2+2=6

(i) Objective function

(ii) Constraints

(iii) Feasible solution

(b) Define convex set. Show that

$$S \quad \{(x_1, x_2) : 3x_1^2 \quad 2x_2^2 \quad 6\}$$

is a convex set. 1+3=4

(c) A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes namely suiting, shirtings and woollens yielding a profit of ₹2, ₹4 and ₹3 per metre respectively. One metre of suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing. Similarly one metre of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing. One metre of woollen requires 3 minutes in each department. In a week, total run time of each department is 60, 40 and 80 hours for weaving, processing and packing respectively. Formulate the above problem mathematically in LPP form. 5

2. *(a)* Solve the following problem graphically : 5+5=10

(i) Maximize $Z \quad 50x_1 \quad 60x_2$

subject to the constraints

$$2x_1 \quad 3x_2 \quad 1500$$
$$3x_1 \quad 2x_2 \quad 1500$$
$$0 \quad x_1 \quad 400$$
and $$0 \quad x_2 \quad 400$$

(ii) Maximize $Z \quad 5x_1 \quad 3x_2$

subject to the constraints

$$x_1 \quad x_2 \quad 6$$
$$2x_1 \quad 3x_2 \quad 6$$
$$0 \quad x_1 \quad 4$$
and $$0 \quad x_2 \quad 3$$

(b) What do you mean by duality? Explain the method of changing primal to dual. 5

UNIT—II

3. *(a)* Explain what you mean by balanced and unbalanced transportation problems. 6

(b) The figures in the cells of the following unbalanced distribution problem are the transportation costs per unit :

	Distribution Centres			
	A	*B*	*C*	*Supply* (units)
X	5	1	7	10
Y	6	4	6	80
Z	3	2	5	15
Demand (units)				105 / 145

Find the optimum solution. 9

4. *(a)* Explain Vogel's approximation method. 5

(b) A tourist company has one car at each of the five depots *a*, *b*, *c*, *d* and *e*. A customer requires a car in each city, namely *A*, *B*, *C*, *D* and *E*. Distance (in km) between depots and cities (destinations) are given in the following matrix :

Cities	*Depots*				
	a	*b*	*c*	*d*	*e*
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	80	80	110
E	55	35	70	80	105

How should the cars be assigned to the customer so as to minimize the distance travelled? 10

UNIT—III

5. *(a)* Explain Gomory's all integer cutting plane method. Find the optimum integer solution of the following LPP : 4+5=9

Maximize $Z \quad 2x_1 \quad 2x_2$

subject to the constraints

$$5x_1 \quad 3x_2 \quad 8$$
$$x_1 \quad 2x_2 \quad 4$$

(b) Write a note on revised simplex method. 6

6. By using revised simplex method, solve the following LPP : 15

Maximize $Z \quad 3x_1 \quad 2x_2 \quad 5x_3$

subject to the constraints

$$x_1 \quad 2x_2 \quad x_3 \quad 430$$
$$3x_1 \quad 2x_3 \quad 460$$
$$x_1 \quad 4x_2 \quad 420$$
$$x_1, x_2, x_3 \quad 0$$

UNIT—IV

7. *(a)* Explain the two-person zero-sum game. What are its assumptions? 4+2=6

(b) The following is known for a project :

Activity	:	1–2	1–3	2–3	2–4	3–4	4–5
Duration	:	20	25	10	12	6	10

Calculate—

(i) network diagram of the project;

(ii) critical path. 9

8. *(a)* Define and explain the following : 6

(i) Activity float

(ii) Total float

(iii) Free float

(b) Use dominance principle to solve the game whose pay-off matrix is given below : 9

Y / X	Y_1	Y_2	Y_3	Y_4	Y_5
X_1	4	6	5	10	7
X_2	6	7	4	8	9
X_3	9	8	10	9	8

UNIT—V

9. *(a)* Define the following : 2×3=6

(i) Reneging

(ii) Balking

(iii) Jockeying

(b) A TV repairman repairs TV sets with time which follows exponential distribution with time 30 minutes. Faulty TV sets come to him at an average rate of 10 per 8 hour-day :

(i) What is his expected idle time each day?

(ii) How many jobs are ahead of the set just brought in? 9

10. *(a)* Explain the sequencing problem. Write the assumptions of sequencing problems. 6

(b) Find the optimal sequence for the following seven jobs and total time : 9

Jobs	:	1	2	3	4	5	6	7
Machine A	:	3	12	15	6	10	11	9
Machine B	:	8	10	10	6	12	1	3

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