2023

BCA 4th Semester Examination

Operation Research

PAPER — 2203

Full Marks : 100

Time : 3 hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer *any* **seven** questions : 7×10=70

1. Use simplex method to solve the LPP

Maximize $Z = 3x_1 + 2x_2$

subject to, $x_1 + x_2 \leq 4, x_1 - x_2 \leq 2$

$x_1 \geq 0, x_2 \geq 0$

2. Solve graphically the LPP

Minimize $Z = 5x_1 + 3x_2$

subject to, $x_1 + x_2 \leq 6, 2x_1 + 3x_2 \geq 6, 0 \leq x_1 \leq 4$

and $0 \leq x_2 \leq 3$

3. Find the feasible solution of the system

$2x_1 + x_2 + 4x_3 = 11, \quad 3x_1 + x_2 + 5x_3 = 14$

4. Describe dual simplex method by elaborating every step.

5. A small project is composed of 7 activities, whose time estimates are listed in the table below :

Activity $(i-j)$	Estimated duration (weeks)		
	Optimistic	Most likely	Pessimistic
1–2	1	1	7
1–3	1	4	7
1–4	2	2	8
2–5	1	1	1
3–5	2	5	14
4–6	2	5	8
5–6	3	6	15

(a) Draw the network diagram of the activities in the project.

(b) Find expected duration and variance for each activity.

(c) What is expected project length?

(d) Find critical path.

6. Solve by big-M method

Minimize $Z = 4x_1 + x_2$

subject to, $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

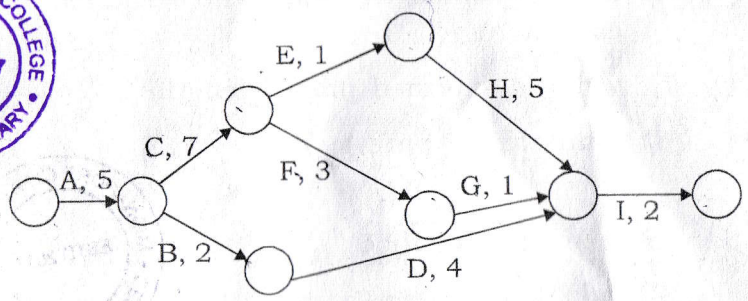
$x_1 + 3x_2 \leq 3$

$x_1 \geq 0, x_2 \geq 0$

7. Find the optimality assignment for the assignment problem with the following cost matrix :

	I	II	III	IV
A	5	3	1	8
B	7	9	2	6
C	6	4	5	7
D	5	7	7	6

8. Answer the following questions of the PERT chart :



(a) Which tasks are on the critical path and what is the minimum time of finishing all the tasks?

(b) What are the slack times for C, D and F?

(c) The person working on task C tells the project manager he can't start work until one day after the scheduled starting date. What impact would this have on the completion date of the project? Why?

9. What is a dual? Where is it used? Formulate a dual for the given LPP

Minimize $Z = 2x + 3y$

such that $-5x + 2y \geq 7$

$3x - 4y \leq 12$

$x \geq 0, y \geq 0$

(Continued)

10. Write short notes on *any* **two** from the following :

(a) Vogel's approximation method

(b) Fulkerson's rule

(c) Hungarian method of solving assignment problem

[Internal Assessment : 30 Marks]

★★★