Graphic Era

Established by an Act of the State Legislature of Uttarakhand (Uttar Pradesh Act No. 12 of 2011), University under section 2(f) of UGC Act, 1956

Term Evaluation (Even) Semester Examination March 2025

Roll no.....

Name of the Course: B.Tech. (Electronics & Communication Engineering)

Semester: IVth

Name of the Paper: Operation Research

Paper Code: HSMC 401

Time: 1. 5 Hour **Maximum Marks: 50**

Note:

(i) Answer all the questions by choosing any one of the sub-questions

(ii) Each question carries 10 marks.

Q1. CO1..... (10 Marks)

a.) Discuss the historical background of Operations Research. Also, describe the need of Operations research in manufacturing.

OR

b.) Solve the given Linear Programming Problem by Graphical method

Min $Z = 1.5x_1 + 2.5x_2$

Subject to constraints, $x_1 + 3x_2 \geq 3$,

$x_1 + x_2 \geq 2$,

and $x_1, x_2 \geq 0$

Q2. CO1..... (10 Marks)

a.) Define the following basic terms with the help of an example:

(i) Solution of a Linear Programming Problem.

(ii) Initial basic feasible solution of a Linear Programming Problem.

(iii) Basic feasible solution in a Linear Programming Problem.

(iv) Write down the standard form of a Linear Programming Problem.

OR

b.) Define the non-degenerate and degenerate feasible solutions. Also, find all the basic feasible solutions of the following equations:

$2x_1 + 6x_2 + 2x_3 + x_4 = 3$,

$6x_1 + 4x_2 + 4x_3 + 6x_4 = 2$.

Term Evaluation (Even) Semester Examination March 2025

Q3. CO1...... (10 Marks)

a.) Define the optimal solution of linear programming problems (LPP) with the help of one example.

OR

b.) Construct the dual of the primal problem:

Max $Z = 2x_1 + x_2 + x_3$,

Subject to conditions: $x_1+x_2+x_3 \geq 6$

$3x_1 - 2x_2 + 3x_3 = 3$

$-4x_1 + 3x_2 - 6x_3 = 1$

and non-negative condition $x_1, x_2, x_3 \geq 0$.

Q4. CO2...... (10 Marks)

a.) State the common and distinguishing features of the assignment and the transportation models.

OR

b.) Determine the basic feasible solution by VAM to the following transportation problem.

	A	B	C	Available
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Requirements	4	2	2	

Term Evaluation (Even) Semester Examination March 2025

Q5. CO2..... (10 Marks)

a.) A certain piece of equipment needs five repair jobs, which have been assigned to five machines. The estimated time (in hours) that each mechanic requires to complete the repair jobs is given in the following table. Determine the minimum time assignment.

	J_1	J_2	J_3	J_4
M_1	12	30	21	15
M_2	18	33	9	31
M_3	44	25	24	21
M_4	23	30	28	14

OR

b.) Can you solve the assignment problem by the linear programming approach? If yes, explain the method.