

- 2 (a) Find the all basic solutions for the equation

$$x_1 + 2x_2 + x_3 = 4$$

$$2x_1 + x_2 + 5x_3 = 5$$

show that the basic solutions are non-degenerate.

- (b) Solve the LPP by using Big - M Methods

$$\text{Max. } Z = -2x_1 - x_2$$

$$\text{Subject to } 3x_1 + x_2 = 3$$

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

$$x_1 + 2x_2 + x_4 = 4$$

$$x_1, x_2, x_3, x_4 \geq 0$$

OR

- 2 (a) Solve the following LPP graphically

$$\text{Max. } Z = 3x_1 + 2x_2$$

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$$\text{Subject to } -2x_1 + x_2 \leq 1$$

$$x_1 \leq 2$$

$$x_1 + x_2 \leq 3$$

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

- (b) Use duality to solve the following LPP :

$$\text{Min. } Z = 10x_1 + 6x_2 + 2x_3$$

$$\text{Subject to } -x_1 + x_2 + x_3 \geq 1$$

$$3x_1 + x_2 - x_3 \geq 2$$

$$x_1, x_2, x_3 \geq 0$$

UNIT - III

- 3 (a) Consider the following data for the activities concerning a project :

Name of activity	Pre - operations	Duration(days)
A	-	2
B	A	3
C	A	4
D	B, C	6
E	-	2
F	E	8

- (i) Draw a network diagram for the above project.
 (ii) Find the minimum time for completion of the project.
 (iii) Describe the critical path
 (iv) Find Float.
- (b) Determine the optimal sequence of jobs that minimizes the total elapsed time on machines M_1, M_2, M_3 in the processing order of $M_1M_2M_3$:

Jobs →	J_1	J_2	J_3	J_4	J_5	J_6	J_7	
M_1	3	8	7	4	9	8	7	Hours
M_2	4	3	2	5	1	4	3	Hours
M_3	6	7	5	11	5	6	12.	Hours

OR

- 3 (a) A simple network is as given below :

Activity	A	B	C	D	E	F	G	H	J	K	L	M	N
Preceding Activity	-	-	A	A	A	C	C	C	B, D	F, J	E, H, G, K	E, H	L, M
Durations	9	3	8	2	3	2	6	1	4	1	2	3	4

- (b) 5 jobs are to be processed on machines M_1 and M_2 in the order M_1M_2 , their processing times are as given below :

Job	M_1	M_2
J_1	5	2
J_2	1	6
J_3	9	7
J_4	3	8
J_5	10	4

Determine :

- (i) The job sequence
 (ii) Total processing time
 (iii) The idle times for M_1 and M_2

UNIT - IV

- 4 (a) Compute L.T. of the following :

(i)
$$f(t) = \begin{cases} \sin(t - \pi/3), & t > \pi/3 \\ 0, & t < \pi/3 \end{cases}$$

$$(ii) f(t) = \begin{cases} e^{t-a}, & t \geq a \\ 0, & t < a \end{cases}$$

- (b) Use Laplace transform technique to solve the following equations : $(D^2 + 9)y = \cos 2t$, $y(0) = 1$, $y(\pi/2) = -1$

OR

- 4 (a) Find the Laplace transform of $\sin \sqrt{x}$. Hence show that

$$L \left\{ \frac{\cos \sqrt{x}}{\sqrt{x}} \right\} = \left(\frac{\pi}{S} \right)^{\frac{1}{2}} e^{-\frac{1}{4S}}$$

- (b) Apply convolution theorem to evaluate

$$L^{-1} \left\{ \frac{P}{(P^2 + a^2)(P^2 + b^2)} \right\}$$

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UNIT - V

- 5 (a) Given the following pairs of values of x and y :

x	5	6	9	11
y	12	13	14	16

Interpolate the value of y at $x = 10$.

- (b) Solve $y_{n+2} - 2y_{n+1} + y_n = n^2 2^n$

OR

- 5 (a) Use Stirling formula to find y_{28} , given

$$y_{20} = 49225, y_{25} = 48316, y_{30} = 47236,$$

$$y_{35} = 45926, y_{40} = 44306$$

- (b) Apply Picard's methods to find the solution of the differential equation :

$\frac{dy}{dx} = y - x$ with $x = 0, y = 2$ upto the third order of approximations.