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3E2071

B. Tech. (Sem. III) (Main/Back) Examination, January - 2013
Computer Engg. & Information Tech.
3IT1 & 3CS1 Mathematics - III

Time : 3 Hours] [Total Marks : 80
[Min. Passing Marks : 24

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.
Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Graph Paper 2. NIL

UNIT - I

1 (a) Obtain the extreme points of

$$f = 20x_1 + 26x_2 + 4x_1x_2 - 4x_1^2 - 3x_2^2$$

(b) Determine the optimal solution for the following NLPP and check whether it maximizes or minimizes the objective function.

Optimize $Z = x_1^2 - 10x_1 + x_2^2 - 6x_2 + x_3^2 - 4x_3$

Subject to $x_1 + x_2 + x_3 = 7$

$x_1, x_2, x_3 \geq 0$

OR

1 (a) Find the extreme points of the function

$f(x, y) = x^3 + 2y^3 + 3x^2 + 12y^2 + 24$ and determine their nature also.

(b) Solve the following :

Min $f(x) = x_1\, x_2\, x_3$

Subject to $g = x_1 + x_2 + x_3 - 1$

UNIT - II

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

Max. $Z = -2x_1 - x_2$

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

Max. $Z = 3x_1 + 2x_2$

Subject to $-2x_1 + x_2 \leq 1$

$x_1 \leq 2$

$x_1 + x_2 \leq 3$

and $x_1, x_2 \geq 0$

(b) Use duality to solve the following LPP :

Min. $Z = 10x_1 + 6x_2 + 2x_3$

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 : $\left(D^2+9\right)y=\cos 2t,\ y(0)=1, y(\pi/2)=-1$

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

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

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.