3E2071

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B.Tech. IIIrd Semester (Main/Back) Examination, Feb. - 2011

Computer Engineering & Information Technology

3IT1 & 3CS1 Mathematics - III

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*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 may 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. Normal distribution Table.

Unit - I

1. a) Assuming that the petrol burnt (per hour) in driving a motor boat varies as the cube of its velocity, show that the most economical speed when going against a current of C km/hr in $\left(\frac{3}{2}\right)C$ km/hr.

b) State Kuhn - Tukkar condition and use K.T. conditions to

Min. $Z = f(x,y,z) = x^2 + y^2 + z^2 + 20x + 10y$

S.t. $x \geq 40$

$x + y \geq 80$

$x + y + z \geq 120$

OR

a) Find the optimum solution of the following constraint multivariable problem.

Min $z = x_1^2 + (x_2+1)^2 + (x_3-1)^2$

S.t. $x_1 + 5x_2 - 3x_3 = 6$

b) Minimize $f(x) = \frac{1}{2}\left(x_1^2 + x_2^2 + x_3^2\right)$

S.t $g_1(x) = x_1 - x_2 = 0$

and $g_2(x) = x_1 + x_2 + x_3 - 1 = 0$

by Lagrange multiplier method.

Unit - II

2. a) A firm manufactures headache pills in two sizes A and B. Size A contains 2 grains of aspirin, 5 grains of bicarbonate and 1 grain of codeine ; size B contains 1 grain of aspirin, 8 grains bicarbonate and 6 grains of codeine. It has been found by users that it require at least 12 grains of aspirin, 74 grains of bicarbonate and 12 grains of codeine for providing immediate effects. Determine graphically the least number of pills a patient should have to get immediate relief.

b) Solve the following L.P.P.

Min. $z = x_1 - 3x_2 + 2x_3$

S.t $3x_1 - x_2 + 3x_3 \le 7$

$-2x_1 + 4x_2 \le 12$

$-4x_1 + 3x_2 + 8x_3 \le 10$

and $x_1, x_2, x_3 \ge 0$

OR

a) Use duality to solve the following LPP :

Min $Z = 3x_1 + x_2$

S.t. $x_1 + x_2 \ge 1$

$2x_1 + 3x_2 \ge 2$

and $x_1, x_2 \ge 0$

b) A company is spending Rs. 1000 on transportation of its units to four warehouses from three factories. What can be the maximum saving by optimal scheduling. Solve the following transportation problem.

Factory ↓	← Warehouses →				Factory Capacity
	W_1	W_2	W_3	W_4	
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Warehouse Requirement	5	8	7	14	34

Unit - III

3. a) Find the sequence that minimize the total elapsed time required to complete the following jobs on two machines M_1 and M_2.

Jobs :	A	B	C	D	E	F	G	H	I
M_1 :	2	5	4	9	6	8	7	5	4
M_2 :	6	8	7	4	3	9	3	8	11

b) Use graphical method to minimize the time needed to process the following jobs on the machines shown below. For each machine find the job which should be done first. Also find the total elapsed time to complete both the jobs.

Job 1 :	Sequence of machines	A	B	C	D	E
	Time (hrs)	3	4	2	6	2
Job 2 :	Sequence of machines	B	C	A	D	E
	Time (hrs)	5	4	3	2	6

OR

a) A project schedule has the following characteristic :

Activity :	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time(days):	4	1	1	1	6	5	4	8	1	2	5	7

i) Construct a network diagram.

ii) Compute the earliest event time and Latest event time

iii) Determine the critical path and total project duration

iv) Compute total float and free float for each activity.

b) A project has a following time estimates :

Activity	Estimated durations (days)		
(i, j)	Optimistic (t_o)	Most likely (t_m)	Pessimistic (t_p)
(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

i) Draw the project network.

ii) Find the expected duration and variance of each activity.

iii) Find the early and late occurrence time for each event and the expected project length.

iv) Calculate the variance and standard deviations of project length.

v) What is the probability that the project will be completed 4 days earlier than expected?

Unit - IV

4. a) Find the Laplace transform of $\frac{Sin^2 t}{t}$ and

find the value of $\int_0^\infty \frac{Sin^2 t}{t^2}\, dt$.

b) Solve $\frac{d^2 y}{dt^2} + 2\frac{dy}{dt} + y = t$

given that $y(0) = -3,\ y(1) = -1$

OR

a) Use convolution theorem to find the inverse Laplace transform of $\frac{s}{(s^2+a^2)^2}$

b) Solve $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}$, where $u = u\ (x,t)$

B.C : $u\ (0,\ t) = 0 = u\ (5,\ t)$ and $u\ (x,0) = 10\ Sin\, 4\pi x$

Unit - V

5. a) Given :

θ :	0°	5°	10°	15°	20°	25°	30°
$\tan\theta$:	0.00	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774

Find the value of tan 3°, tan 16°, tan 28° stating the appropriate formula used.

b) Using Runge - Kutta method, find the approximate value of $y\ (0.2)$ if

$\frac{dy}{dx} = x + y^2$ given that $y = 1$ when $x = 0$ take $h = 0.1$

OR

a) Given

x :	1	1.2	1.4	1.6	1.8	2.0
$f(x)$:	0	0.1280	0.5440	1.2960	2.4320	4.0

Find : $f(1.1),\ f'(1.2),\ f'(1.8)$

b) Use Milne's Predictor - Corrector method to solve the equation

$\frac{dy}{dx} = x - y^2$ at $x = 0.8$, given that

$y\ (0) = 0,\ y\ (0.2) = 0.02,\ y\ (0.4) = 0.0795,\ y\ (0.6) = 0.1762.$