M.E. DEGREE EXAMINATIONS: DECEMBER 2009

First Semester

CAD / CAM

MAT503: Applied Mathematics

Time: Three Hours   **Maximum Marks: 100**

Answer All the Questions:-

PART A (10 x 2 = 20 Marks)

1. Show that the transformation $y = ax^2$ is not linear.

2. How can the matrix of the composite transformation be defined?

3. Write down Khun-Tucker conditions to maximize $z = f(x)$ subject to

   $h^i(x) \leq 0 \ (i = 1, 2, \ldots\ldots\ldots\ldots m), x \geq 0.$

4. Define Quadratic programming.

5. What do you mean by B-spline curve?

6. Define Bezier surface.

7. Write any two differences between CRD and RBD.

8. Define local control.

9. State any four operations on fuzzy relation.

10. What are the three basic operators used in Genetic algorithms?

PART B (5 x 16 = 80 Marks)

11. (a) Find the matrix of the linear transformation T defined on R^3 by

    $T(a, b, c) = (2b + c, a - 4b, 3a)$ corresponding to the bases

    (i) $B = \{(1,0,0,), (0,1,0), (0,0,1)\}$

    (ii) $B_1 = \{(1,1,1), (1,1,0), (1,0,0)\}$

(OR)

    (b) (i) If T_1 and T_2 are linear transformations on R^2 defined by $T_1(a, b) = (b, a)$ and

    $T_2(a, b) = (a, 0)$ for each $a, b \in R$, find formulas for $T_2 + T_1$, $T_2 T_1$. Also find

    their matrices with respect to standard basis of R^2.   (10)

    (ii) Show that the mapping T defined as $T(a, b) = (a + b, a - b, b) \ \forall \ (a, b) \in R^2$

    is a linear transformation.   (6)

12. (a) (i) Determine the relative maximum and minimum (if any) of the function

$$f(x_1, x_2, x_3) = x_1 + 2x_3 + x_2 x_3 - x_1^2 - x_2^2 - x_3^2 .$$ (8)

(ii) Solve the following NLPP by using Lagrangian multipliers:

Minimize $z = x_1^2 + x_2^2 + x_3^2$ subject to $4x_1 + x_2^2 + 2x_3 = 14.$ (8)

(OR)

(b) Use the Kuhn-Tucker conditions to solve the following NLPP:

Minimize $f(x) = (x_1 + 1)^2 + (x_2 - 2)^2$ subject to $0 \le x_1 \le 2$ and $0 \le x_2 \le 1$.

13. (a) Using Hermite's interpolation, obtain $f(0.5)$ and $f(-0.5)$ from the following

data:

x :	-1	0	1
f :	1	1	3
f' :	-5	1	7

(OR)

(b) Find the cubic spline for the data:

x :	0	1	2	3
$f(x)$:	1	2	9	28

14. (a) Analyze the variance in the Latin square of yields (in kilograms) of paddy, where P, Q, R, S denote the different methods of cultivation.

S122	P121	R123	Q122
Q124	R123	P122	S125
P120	Q119	S120	R121
R122	S123	Q121	P122

Examine whether the different methods of cultivation have given significantly different yields.

(OR)

(b) The following data represents the number of units of production per day turned out by different workers using 4 different types of machines.

Machine Type

Workers		A	B	C	D
	1	44	38	47	36
	2	46	40	52	43
	3	34	36	44	32
	4	43	38	46	33
	5	38	42	49	39

Test whether the five men differ with respect to mean productivity and whether the mean productivity is the same for the four different machine type.

15. (a) (i) Let $A = \frac{0.3}{x_1} + \frac{0.7}{x_2} + \frac{1}{x_3}$ and $B = \frac{0.8}{y_1} + \frac{0.4}{y_2}$ be two fuzzy sets. Find the Cartesian

product. (4)

(ii) Consider the following fuzzy relations

$$R = \begin{array}{c} \\ x_1 \\ x_2 \end{array} \begin{array}{cc} y_1 & y_2 \\ \begin{bmatrix} 0.5 & 0.4 \\ 0.7 & 0.3 \end{bmatrix} \end{array}$$

$$S = \begin{array}{c} \\ y_1 \\ y_2 \end{array} \begin{array}{ccc} z_1 & z_2 & z_3 \\ \begin{bmatrix} 0.6 & 0.2 & 0.4 \\ 0.3 & 0.1 & 0.5 \end{bmatrix} \end{array}$$

Find R_oS using max - min composition and max - product composition. (12)

(OR)

(b) (i) Discuss the advantages of Neural Networks. (8)

(ii) What is meant by Genetic Algorithm? Discuss briefly the crossover operator with an example. (8)

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