KUMARAGURU college of technology
character is life

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M.E DEGREE EXAMINATIONS: JAN 2015

(Regulation 2014)

First Semester

CAD/CAM

P14MAT103: Applied Mathematics

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

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1. Which of the following statements are not correct? [K_2]

1. A linear transformation is non singular iff it is injective

2.A linear transformation is injective iff kernel is zero

3.All linear transformations obey the principle of superposition

4.The dimension of the vector space formed by the set of linear transformation $L(V_n, W_m)$ is dim V_n X dim W_m

a) 2,3,4 b) 1,3

c) 1,2 d) 1

2. Match list I with list II (conditions for the existence) and select the correct answer using the codes given below: [K_1]

List I	List II
1.Left inverse	surjective
2. Right inverse	bijective
3.Inverse	one to one homeomorphism
4. Isomorphism	injective

Codes:

	A	B	C	D
(a)	4	2	3	1
(b)	2	4	1	3
(c)	4	1	2	3
(d)	1	2	3	4

3. The steps to solve the quadratic programming problem is [K_3]

1. The system of constraints is to be formed

2.Solve the model by two phase simplex method

3.Add an artificial variable to the first n constraints which has n basic variable in it

4. A minimization type objective function is formed by summing the artificial variables

a) 1-3-4-2 b) 1-2-3-4

c) 1-3-2-4 d) 4-3-1-2

4. Match list I ($X^T QX$)with list II and select the correct answer using the codes given below: [K_1]

List I List II

A.	Positive definite	1. concave
B.	Negative definite	2. Strictly convex
C.	Positive semi definite	3. Strictly concave
D.	Negative semi definite	4. convex

Codes:

	A	B	C	D
(a)	4	3	2	1
(b)	2	4	3	1
(c)	4	1	2	3
(d)	2	3	4	1

5. Assertion (A) : Bezier-spline curve lies on Bezier –spline surface. [K_2]

Reason (R) : Bezier or b–spline surface does not contain the given end points.

a) both A and R are individually true but R is the correct explanation of A

b) both A and R are individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

6. Arrange the following steps to trace the B-spline curve [K_2]

1. Initialize the control points that are used to create the B-spline curve.
2. The first point is used 3 times to fasten the curve to the first part.
3. Extend the curve by adding the next point to the group of four that defines a curve segment, draws the segment and resets the control points for the next segment
4. Evaluate the parametric equations at the end points of the short straight lines that will create the curve.

a) 1-3-4-2

b) 1-2-3-4

c) 1-4-2-3

d) 4-3-2-1

7. [K_2]
1. Each sample taken is a random sample
2. The observations are dependent.
3. Parent population from which observations are taken is normal.
4. Variances of the population are equal.

Which of the following statements are correct?

a) 1,2,3

b) 1,3,4

c) 1,2,4

d) 2,3,4

8. Assertion (A) : 2×2 Latin square is not-possible [K_2]

Reason(R) : Mean square error is not defined if the degrees of freedom is 2.

a) both A and R are individually true but R is the correct explanation of A

b) both A and R are individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

9. Three basic operators, largely used in genetic algorithm are [K_2]

a) multiplier, cross over, mutation

b) Reproduction, cross over, mutation

c) cross over, mutation, sharing,

d) equator, multiplier, adder

10. In fuzzy set theory membership function in crisp set maps whole members in universal set X to [K_3]

a) R

b) Z

c) (0,1)

d) $(0,\infty)$

PART B (10 x 2 = 20 Marks)

11. Let L, K be the two linear transformation from $R \to R$ defined by $Lx = x + 5,\ Kx = x - 5, x \in R$. [$K_3$]

    Find the inverse.

12. Determine the kernel of $L(x, y) = (\cos x, \sin y)$ [K_4]

13. When will you say the necessary condition becomes sufficient condition while solving NLPP with two variables. [K_4]

14. Define saddle point . [K_2]

15. Differentiate B-spline curve with Bezier curves. [K_2]

16. Interpret Spline curve physically. [K_2]

17. What are the uses of analysis of variance? [K_4]

18. Compare and contrast LSD and RBD. [K_2]

19. Let $A = \{(x_1, 0.2), (x_2, 0.7), (x_3, 0.4)\}$ and $B = \{(x_1, 0.6), (x_2, 0.4), (x_3, 0.9)\}$. [$K_4$]

    Find $\tilde{A}^c \cap \tilde{B}^c$.

20. State De Morgan's laws and Excluded middle law under Fuzzy variables. [K_2]

PART C (6 x 5 = 30 Marks)

21. Let A , the matrix representation of a linear transformation L : $R^3 \to R^3$ with respect to the basis $[5\ \ 1\ \ 3]^T$, $[3\ \ 2\ \ 2]^T$ and $[1\ \ 2\ \ 1]^T$ be given by $A = \begin{bmatrix} 3 & 2 & -2 \\ -1 & 0 & 1 \\ 2 & 1 & -1 \end{bmatrix}$. [$K_5$]

    Construct the linear transformation L.

22. Evaluate the NLPP : *Minimize* $z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$ subject to the constraints $x_1 + x_2 + x_3 = 20,\ x_1, x_2, x_3 \geq 0$ [K_4]

23. Identify the cubic spline and evaluate y(1.5) and $y'(3)$ for the following data [K_4]

X:	1	2	3	4
Y:	1	2	5	11

24. Two tests are made of the compressive strength of each of 6 samples of poured concrete. The force required to crumble each of 12 cylindrical specimens, measured in kilograms, is as follows: [K_5]

	A	B	C	D	E	F
Test 1	110	125	98	95	104	115
Test 2	105	130	107	91	96	121

    Test at the 0.05 level of significance whether these samples differ in compressive strength.

25. Explain the different types of neural network with examples. [K_5]

26. Asses the composite transformation $(L \bullet K \bullet M)(x\ \ y\ \ z)$ when $L(x\ \ y\ \ z) = (x - y \quad y - z \quad z - x)$, $K(x\ \ y\ \ z) = (x + y \quad y + z \quad z + x)$ and $M(x\ \ y\ \ z) = (x - y - z \quad y - z - x \quad z - x - y)$. [$K_4$]

PART D (4 x 10 = 40 Marks)

27. Determine x_1, x_2 *and* x_3 so as to maximize $Z = -x_1^2 - x_2^2 - x_3^2 + 4x_1 + 6x_2$ subject to the constraints $x_1 + x_2 \le 2,\ 2x_1 + 3x_2 \le 12$ *and* $x_1, x_2 \ge 0$. [K_4]

28. Employ Hermite's interpolation formula to find f(1.05) given f(1) = 0.84147, f(1.1) = 0.89121, f'(1) = 0.5403, f '(1.1) =0.4536. [K_3]

29. [K_5]

The figures in the following 5x5 Latin Square are the numbers of the engines E_1, E_2, E_3, E_4&E_5 tuned up by mechanics M_1, M_2, M_3, M_4&M_5 ran with gallon of fuel A, B, C, D and E.

	E_1	E_2	E_3	E_4	E_5
M_1	A31	B24	C20	D20	E18
M_2	B21	C27	D23	E25	A31
M_3	C21	D27	E25	A29	B21
M_4	D21	E25	A33	B25	C22
M_5	E21	A37	B24	C24	D20

Use the level of significance $\alpha = 0.01$ to test

(i) the null hypothesis H_0 that there is no difference in the performance of the five engines

(ii) H_0 that the engines perform equally well with each of the fuels.

30. [K_5]

Three fuzzy sets are defined as follows:

$$\tilde{A} = \left\{\frac{0.1}{30} + \frac{0.2}{60} + \frac{0.3}{90} + \frac{0.4}{120}\right\}$$

$$\tilde{B} = \left\{\frac{1}{1} + \frac{0.2}{2} + \frac{0.5}{3} + \frac{0.7}{4} + \frac{0.3}{5} + \frac{0}{6}\right\}$$

$$\tilde{C} = \left\{\frac{0.33}{100} + \frac{0.65}{200} + \frac{0.92}{300} + \frac{0.21}{400}\right\}$$

Find the following:

- $\tilde{R} = \tilde{A} \times \tilde{B}$
- $\tilde{S} = \tilde{B} \times \tilde{C}$
- $\tilde{T} = \tilde{R} \circ \tilde{S}$ using max – min composition
- $\tilde{T} = \tilde{R} \circ \tilde{S}$ using max – product composition

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