Dumkal College

U.G. 2nd Semester 1st Internal Examination-2024

MATHEMATICS
[MAJOR]
Course Code: MATH-T-02 & MATH-SEC-T-02

Full Marks: 10+10   Time: 1 Hour

The figures in the right- hand margin indicate marks.
Symbols have their usual meaning.

MATH-T-02

1. Answer any **two** questions: $2 \times 3 = 6$

   (a) Find the general value of i^i.

   (b) If one root of the equation $x^4 - 3x^3 - 5x^2 + 9x - 2 = 0$ is $2 - \sqrt{3}$, find the other roots.

   (c) Does the set $\{1, \omega, \omega^2\}$ where ω is the cube root of unity form a multiplicative group? Justify your answer.

2. Answer any **one** question: $1 \times 4 = 4$

   (a) Apply Descartes' rule of signs to prove that the equation $x^7 - 2x^4 + 3x^3 - 1 = 0$ has at least four imaginary roots.

   (b) Express the following permutation as a product of transposition and hence find whether it is odd or even: $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 5 & 4 & 2 & 6 & 1 & 3 \end{pmatrix}$.

1. Answer any **five** questions: $5 \times 2 = 10$

   (a) Write a difference between a fuzzy set and a crisp set.

   (b) Define α-Cut and strong α-Cut.

   (c) What is a normal fuzzy set? Give an example.

   (d) Define support of a fuzzy set with example.

   (e) Compute the scalar cardinality and relative cardinality of the following fuzzy set:

   $$\tilde{A} = \frac{0.4}{1} + \frac{0.2}{2} + \frac{0.5}{3} + \frac{0.4}{4} + \frac{1}{5}.$$

   (f) If $\tilde{A} = \frac{0.15}{50} + \frac{0.25}{100} + \frac{0.5}{150} + \frac{0.7}{200}$ and $\tilde{B} = \frac{0.2}{50} + \frac{0.3}{100} + \frac{0.6}{150} + \frac{0.65}{200}$, find $\tilde{A} \cup \tilde{B}$.

   (g) For any fuzzy set A and $\alpha, \beta \in [0,1]$ such that $\alpha \leq \beta$, prove that $\alpha_A \supseteq \beta_A$.

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