MANONMANIAM SUNDARANAR UNIVERSITY

DIRECTORATE OF DISTANCE AND CONTINUING EDUCATION

INTERNAL ASSIGNMENT FOR MAY 2024 EXAMINAITONS

M. Sc Mathematics – First Semester

Algebraic Structures

Sub-Code: SMAM11

SMAM11 Algebraic Structures.

1. Let G be a group of order pqr, $p<q<r$ primes. Prove
   (i) the r-Sylow subgroup is normal in G
   (ii) G has a normal subgroup of order qr.

(or)

1. Let G be a finite abelian group. Then G is isomorphic to a direct product of a finite number of cyclic groups.

2. If $T \in A(V)$ has all its characteristic root in F, then there is a basis of V in which the matrix of T is triangular.

(or)

b) If F is a field of characteristic 0, and if $T \in A_F(V)$ is such that [redacted] $\operatorname{tr} T^i = 0$ for all $i \geq 1$, then T is nilpotent.

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M. Sc Mathematics – First Semester

Real Analysis - I

Sub-Code: SMAM12

SMAM12 Real Analysis-I

1) a) Let f be bounded variation on $[a,b]$. Let V be defined on $[a,b]$ as follows: $V(x) = V_f(a,x)$ if $a < x \leq b$, $V(a)=0$. Then (i) V is an increasing function on $[a,b]$ (ii) $V-f$ is an increasing function on $[a,b]$.

(or)

b) If $f \in R(\alpha)$ and if $g \in R(\alpha)$ on $[a,b]$, then $C_1 f + C_2 g \in R(\alpha)$ on $[a,b]$ for any two constants C_1 and C_2. and we have $\int_a^b (C_1 f + C_2 g)\, d\alpha = C_1 \int_a^b f\, d\alpha + C_2 \int_a^b g\, d\alpha$.

2) a) State and prove Second Mean-Value theorem for Riemann Integrals.

(or)

b) State and prove Abel's Test for Uniform Convergence.

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M. Sc Mathematics – First Semester

Ordinary Differential Equations

Sub-Code: SMAM13

SMAM13 Ordinary Differential equations

1) a) Compute the first four approximation $\varphi_0, \varphi_1, \varphi_2, \varphi_3$.

(i) $y' = x^2+y^2$, $y(0)=0$

(ii) $y' = 1+xy$, $y(0)=1$

(iii) $y' = y^2$, $y(0)=0$

(iv) $y' = y^2$, $y(0)=1$.

(or)

b) Find the solution of the following equations.

(i) $\frac{dy}{dx} = \frac{x+2y+3}{2x+y+3}$, (ii) $\frac{dy}{dx} = \frac{x-y+3}{2x-2y+5}$.

2) a) Find the real-valued solutions of the following equations.

(i) $y' = x^2y$ (ii) $yy' = x$.

(or)

b) Find all solutions of the following equations for $x > 0$.

(i) $x^2y'' + 2xy' - 6y = 0$

(ii) $2x^2y'' + xy' - y = 0$.

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INTERNAL ASSIGNMENT FOR MAY 2024 EXAMINAITONS

M. Sc Mathematics – First Semester

Graph Theory and Applications

Sub code : SMAE11

SMAE11 Graph Theory and Applications.

1) a) State and prove necessary and sufficient condition for cut-edge of a graph.

(or)

b) For any loop-less connected graph G; prove $K(G) \leq \lambda(G) \leq \delta(G)$.

2) a) State and prove Whitney's theorem.

(or)

b) Prove that every connected graph contains a spanning tree.

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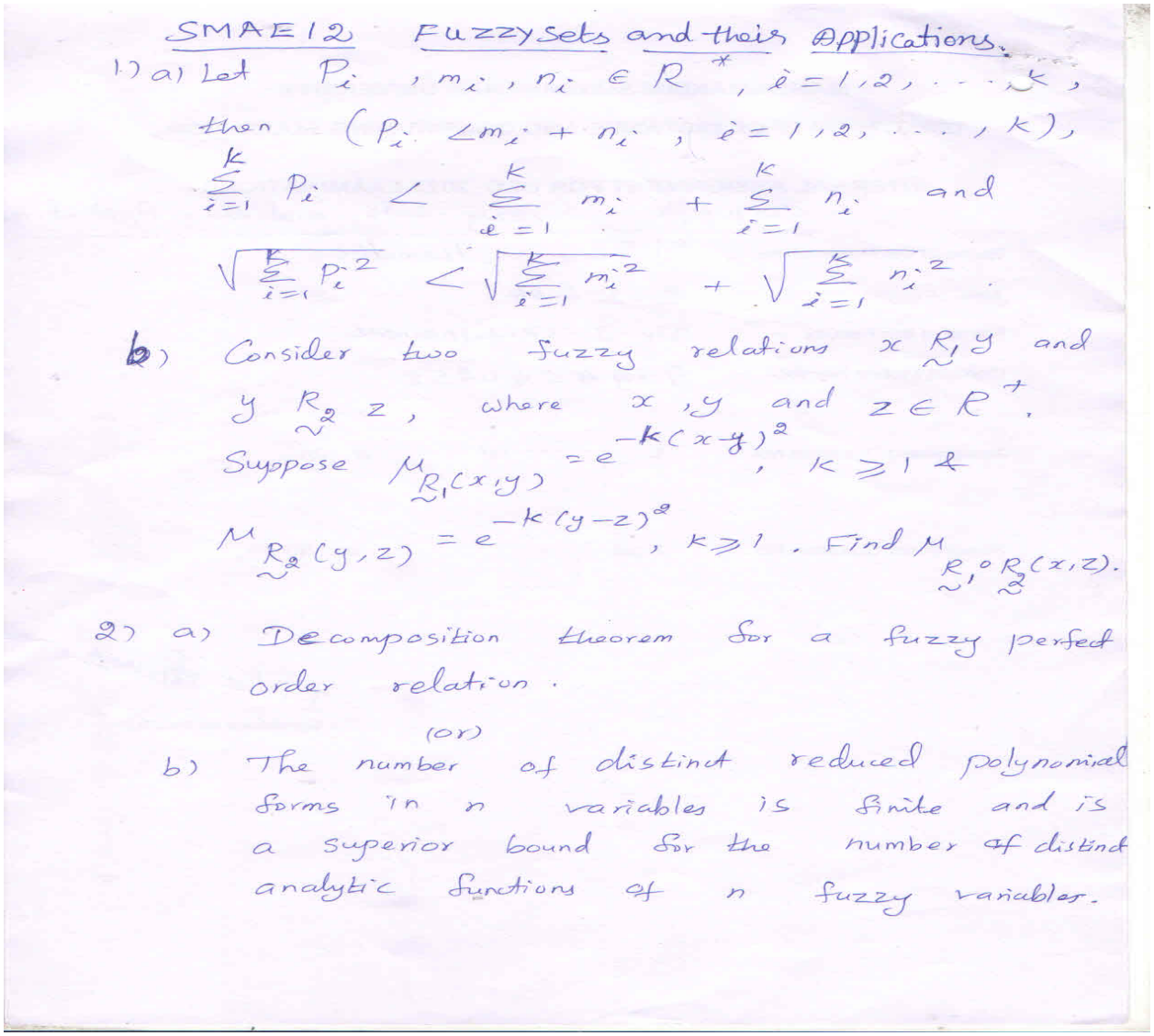
INTERNAL ASSIGNMENT FOR MAY 2024 EXAMINAITONS

M. Sc Mathematics – First Semester

Fuzzy Sets and their Applications

Sub-Code: SMAE12



SMAE12 Fuzzy sets and their Applications.

1) a) Let $P_i, m_i, n_i \in R^*$, $i = 1, 2, \ldots, k$, then $(P_i \angle m_i + n_i, i = 1, 2, \ldots, k)$,

$$\sum_{i=1}^{k} P_i \angle \sum_{i=1}^{k} m_i + \sum_{i=1}^{k} n_i \quad \text{and}$$

$$\sqrt{\sum_{i=1}^{k} P_i^2} < \sqrt{\sum_{i=1}^{k} m_i^2} + \sqrt{\sum_{i=1}^{k} n_i^2}.$$

b) Consider two fuzzy relations $x \underset{\sim}{R_1} y$ and $y \underset{\sim}{R_2} z$, where x, y and $z \in R^+$. Suppose $\mu_{\underset{\sim}{R_1}}(x,y) = e^{-k(x-y)^2}$, $k \geq 1$ & $\mu_{\underset{\sim}{R_2}}(y,z) = e^{-k(y-z)^2}$, $k \geq 1$. Find $\mu_{\underset{\sim}{R_1} \circ \underset{\sim}{R_2}}(x,z)$.

2) a) Decomposition theorem for a fuzzy perfect order relation.

(or)

b) The number of distinct reduced polynomial forms in n variables is finite and is a superior bound for the number of distinct analytic functions of n fuzzy variables.