WA-5709

M. A. / M. Sc. (Sem. II) Examination, June - 2024

MATHEMATICS

PAPER - MATH 2C4

Methods of Applied Mathematics-II

Time Allowed : **Three Hours**

Maximum Marks : **100**

Note : *This question paper contains* ***two*** *sections as under :.*

Section-A ***Max. Marks-20***

This section will have 10 questions, having 02 questions from each unit with no internal choice. Answer in about 20 words. All questions will have equal marks. **(10×02=20)**

Section-B ***Max. Marks-80***

This section will have 10 questions, having 02 questions from each unit, one question to be attempted from each unit. Words limit approximately 400-500 words. Questions may have sub divisions. All questions will have equal marks. **(16×05=80)**

SECTION - A

1 (i) Define the principle of Mathematical induction.

(ii) Define validity of statement.

(iii) Define predicate logic.

(iv) Define directed graph.

(v) Define binary search tree.

(vi) Define distributed Lattice.

(vii) Write leibniz rule for fraction derivatives.

(viii) Write geometric interpretation of fractional derivatives.

(ix) Write two properties of fractional derivatives.

(x) Define sequential fractional derivatives.

SECTION - B

UNIT - I

2 (a) Prove that $2^n > n^2$, if $n \geq 5$ and $n \in N$.

(b) Let $P \equiv$ triangle ABC is a right-angled triangle and $q \equiv (AB)^2 + (BC)^2 = (AC)^2$. Then for proposition $p \rightarrow q$, state its converse, inverse and contra positive.

OR

(a) Give a proof by contradiction of the theorem, "if $3n + 2$ is odd, then n is odd."

(b) For any Boolean algebra B, prove that

$\forall a, b, c \in B$

$$(a+b).(b+c).(c+a) = a.b + b.c + c.a .$$

UNIT - II

3 (a) Show that a connected graph G is a Euler graph iff all vertices of G are of even degree.

(b) Design a circuit using gates to realize the following :. $F = (x + yz)\ (y + zx)$

OR

(a) Let G be the connected, plainer simple graph with e-edges, v-vertices, if r be the no. of region in a planner graph representing G then $r = e - v + 2$.

(b) With the help of truth table prove that $\sim (p \rightarrow 2) \equiv p \wedge \sim q$

UNIT - III

4 (a) Display a binary tree with 11 vertices and height 5. Also write the difference between binary tree and complete binary tree.

(b) Show that if TS not necessary that union of two sub lattices TS again a sublattices.

OR

(a) Show that dual of a lattice is a lattice.

(b) If T is a binary tree with n vertices and of height h, then show that

$$(h+1) \leq n \leq (2^{h+1}-1)$$

UNIT - IV

5 Evaluate :

(a) ${}_{\alpha}I_x^{\alpha}(x^n)$

(b) Find fractional integral of e^{kx}.

OR

(a) Find fractional RLI of sinx.

(b) Find G-L fractional derivative of $(x-a)^n$ of order α.

UNIT - V

6 (a) Derive laplace transform of Caputo's fractional derivatives.

(b) Derive fourier transform of *R-L* fractional derivative.

OR

(a) Derive fourier transform of *G-L* fractional derivative.

(b) P.T. $L\left[{}_{o}^{GL}D_{x}^{\alpha} f(t) \right] = S^{\alpha} F(s)$

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