301122 (240)

VCD/ **FYBSC- SEM I MATHEMATICS I- 75MARKS- 2½HRS**

NOTE : **1)All questions are compulsory.**

2) **For Q.1, Q.2 and Q. 3 attempt any one subquestion (each 8 marks) from part (a), and any two subquestions (each 6marks) from part (b).**

3) **For Q.4 , attempt any three. (each 5 marks)**

Q.1. (a) Attempt any one. [each 8Mks]

1) State the properties of real numbers with respect to multiplication and prove that multiplicative identity is unique.
2) State and prove Cauchy Schwarz Inequality.

(b) Attempt any two. [each 6Mks]

1) State and prove Archimedian Property of real numbers. Using it prove that if $x \in R^+$,there exist $n_0 \in N$ such that $\frac{1}{n_0} < x$.

2) Define Infimum of a Nonempty subset S of R and Prove that Let S be a subset of R then Infimum of S whenever exist is unique.

3) Prove that the square of a real number is always non negative.

Q.2. (a) Attempt any one. [each 8Mks]

1) Prove that Every convergent sequence in R is bounded and give an example of a bounded sequence but not convergent

2) Prove that: If $x_n \neq 0$ is a sequence in R for any $n \in N$ and $x \neq 0$ then $(x_n \to x) \Rightarrow \left(\frac{1}{x_n}\right) \to \left(\frac{1}{x}\right)$.

(b) Attempt any two. [each 6Mks]

1) Prove that A convergent sequence of non-negative real number has a non-negative limit.

2) Prove that If (x_n) is a sequence in R such that $(x_n) \to x$ and $\alpha \in R$, then $(\alpha x_n) \to \alpha x$ *in R*.

3) Use $(\varepsilon - n_0)$ definition to show that $\frac{n^2-3n+1}{n^2+n+2}$ has limit 1 as n tends to infinity.

Q.3. (a) Attempt any one. [each 8Mks]

1) Define homogeneous Differential equation & solve: $x \sin\frac{y}{x}\frac{dy}{dx} = y \sin\frac{y}{x} + x$

munotes.in

2) Define Linear Differential Equation (LDE) & solve LDE: x $\frac{dy}{dx}$ = 4 – 2y with initial condition y (1) = 0

(b) Attempt any two. [each 6 Mks]

1) Find the current in R-C circuit with R = 20Ω, C = 0.01F, E(t) = $200e^{-5t}$, I (0) = 0
2) Check exactness and solve DE, (2x log x – xy) dy + 2y dx = 0
3) Find a family of orthogonal trajectories for the family of curves $x^2 - y^2 = c$, $c \neq 0$

Q.4.Attempt any three. [each 5 Mks]

1) Find the l.u.b and g.l.b of the set S={x∈R/x²-x-6<0}
2) Find disjoint neighbourhood of a =1.5, b =1.6
3) For the sequence (x_n) where n^{th} terms are given below, state whether they are bounded above or below and also whether they are monotonic increasing or monotonic decreasing.
$x_n = 3n^2 + 2$

4)Discuss the convergence of (a_n) if $(a_n) = \frac{n}{2^n}$ in R

5)If the population of a country doubles in 50 years, in how many years will it triple under the assumption that the rate of increase is proportional to the number of people in that country?

6) Reduce to first order and solve, y y'' + y'² = 0

xxxxxxxxxx

munotes.in