Total No. of Questions : 05] [SET-A] [Total No. of Printed Page : 02

FINAL EXAMINATION – JULY 2017
MASTER OF SCIENCE (M.Sc. MATHEMATICS)
First Year – First Semester
Real Analysis – I

1M.Sc. 2

Time : 3 Hours **Max Marks : 70**
Min. Marks : 25

Note :- Solve any two parts from each question. All questions carry Equal marks.

Q.1. (a) State and prove Cesaro's theorem.

(b) State and prove Nested interval theorem.

(c) If $\{S_n\}$ is a convergent sequence of real numbers and if $\lim S_n = l$, then prove that $\overline{lim}\, S_n = \underline{lim}\, S_n = l$ conversely, if $\overline{lim}\, S_n = \underline{lim}\, S_n = l \in R$, then prove that $\{S_n\}$ is convergent and $\lim_{n\to\infty} S_n = l$.

Q.2. (a) State and prove Cauchy's condensation test.

(b) Test for convergence of the series

(i) $x + \frac{2^2x^2}{2!} + \frac{3^3x^3}{3!} + \frac{4^4x^4}{4!} + \cdots$

(ii) $\frac{1}{(log\,2)^P} + \frac{1}{(log\,3)^P} + \cdots + \frac{1}{(log n\,)^P} + \cdots$

(c) State and prove D'Morgan and Bertrand's Test.

Q.3. (a) State and prove general principle of convergence.

(b) Suitably deranging the series

$S = 1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6} + \cdots$

Prove that $S = \frac{1}{2}S$. explain the fallacy.

(c) State and prove Euler's constant theorem.

Q.4. (a) State and prove Bolzano - Weierstrass theorem.

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(b) Prove that the real line R is of the second category.

(c) Prove that every closed and bounded set of real numbers is compact.

Q.5. (a) State and prove Bolzano's theorem on continuity.

(b) State and prove Darboux theorem.

(c) State and prove Cauchy's mean value theorem.

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(b) State and prove Darboux theorem.

(c) State and prove Cauchy's mean value theorem.

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