# 2018

## M.Sc.

## 2nd Semester Examination

## APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

**PAPER—MTM-206 (Unit-I)**

**Subject Code—21**

*Full Marks* : 25

*Time* : 1 Hour

*The figures in the right-hand margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

*Illustrate the answers wherever necessary.*

### *(General Topology)*

Answer Q. No. *1* and any *two* from the rest.

**1.** Answer any *two* questions : 2×2

(a) Compare box topology and Product topology on the product space $\Pi x_\alpha$.

(b) Let Y = [1, 2) ∪ {3} be a subset of $\mathbb{R}$. Show that the subspace topology on Y is different from the order topology on Y.

*(Turn Over)*

(c) Define locally connected and locally compact topological spaces.

2. (a) Let Y be a subspace of X. Then show that a set A is closed in Y if and only if $A = G \cap Y$, where G is closed set in X.

(b) Let X and Y be topological spaces and $f : X \to Y$ be a function. Then show that the following are equivalent—

(i) For every closed set B of Y, the set $f^{-1}$ (B) is closed in X,

(ii) For every subset A of X, $f\left(\overline{A}\right) \subseteq \overline{f\left(A\right)}$. 4+4

3. (a) Show that $\mathbb{R}^{w}$ in the box topology is not metrizable.

(b) Define path-connected topological space with example.

Let $\{A_\alpha\}$ be a collection of connected subspaces of X. Let A be a connected subspace of X. Show that if $A \cap A_\alpha \neq \phi$ for all $\alpha$, then $A \cup (\cup A_\alpha)$ is connected.

4+4

4. (a) Give an example of a topological space which is 1st countable but not 2nd countable.

(b) Show that every compact $T_2$-space is normal.

(c) Show that a subspace of a completely regular space is completely regular. 2+3+3

***[Internal Assessment — 5 Marks]***

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