2024

M.Sc. 2nd Semester Examination

APPLIED MATHEMATICS

PAPER : MTM-206

(General Topology)

Full Marks : 20

Time : 1 hour

A. Answer any **two** questions : 2×2=4

1. What is the basis for an ordered set *X*?

2. Is the space $\mathbb{R}_l$ connected? Justify your answer.

3. Show that subspace of a Hausdorff space is Hausdorff.

4. Define Quotient topology. Illustrate it with an example.

B. Answer any **two** questions : 4×2=8

5. Let Y be an ordered set in the ordered topology. Let $f, g : X \to Y$ be continuous. Show that the set $\{x \in X \mid f(x) \leq g(x)\}$ is closed in X.

6. Show that every compact subspace of a Hausdorff space is closed.

7. Show that $\mathbb{R}^{\omega}$ in the box topology is not metrizable.

8. In the finite complement topology on $\mathbb{R}$, to what point or points does the sequence $x_n = \frac{1}{n^3}$ converge? Justify.

C. Answer *any* **one** questions : 8×1=8

9. *(i)* Show that $\mathbb{R}^{\omega}$ in the uniform topology satisfies the first countability axiom but it does not satisfy the second countability axiom. 4

(ii) Is every metrizable space normal? Justify. 4

10. *(i)* Let $p : X \to Y$ be a closed continuous surjective map such that $p^{-1}(\{y\})$ is compact for each $y \in Y$. Show that if X is regular, then so is Y. 4

(ii) Show that $\mathbb{R}^{\omega}$ in the product topology is connected. 4

★★★