2020-2021 Semester - I : Mathematical Methods-Analysis

09-02-2021 Mid-semester examination Duration: 2 hours

Note: (i) Submission should be in the form of PDF file.
(ii) Terminology is as used in class.
(iii) Each question carries 10 marks. (Maximum marks: 40)

1. (Each part carries 5 marks.)

   (i) Determine if the series

   $$\sum_{n=1}^{\infty} \frac{n!}{n^n}$$

   converges or diverges.

   (ii) Let

   $$f(x) = x|x|,\ x \in (-1, 1).$$

   Is f a differentiable function on $(-1, 1)$? Justify your answer.

2. A ladder 26 ft. long leans against a vertical wall. The lower end (of the ladder) is being moved away from the wall at a rate of 5 ft./ sec. when the lower end is 10 ft. from the wall. How fast is the height of the top end (from the ground) changing at that point in time?

3. A square piece of a material has side 10 cm. An open box is made from the material by removing equal squares at each corner, and turning up the sides. Find the dimensions of the box of largest volume that can be made in this manner.

4. Find

   $$\int e^{-4x} \cos(2x) dx.$$