

820220020294

IIITS/M-2023/ Term - I

Exam Date: September, 2023

# Indian Institute of Information Technology Sri City (IIITS)

Name of the Exam: RANAC

Duration: 1.5 hrs

Max. Marks: 20

## Instructions:

1. Marks are indicated in [ ] after each question.
2. Rough Work should be done separately, not with the answers.
3. **Answers should be reasoned and derived clearly, not a single word answer.**
4. Be short and precise. Provide answer to exactly what is asked for.
5. Scientific calculators are allowed
6. The exam is not open book and student(s) are not allowed to bring Text book(s)/ Photocopies / Hand-written notes / laptops.
7. Follow the instructions mentioned in the questions. Answer all the questions.
8. Return the question paper along with your answer sheet before leaving the exam hall.

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1. Prove that the sequence  $\left\{ \frac{2n-7}{3n+2} \right\}$

- (a) is monotonically increasing
- (b) is bounded
- (c) Find the limit.

[3M]

2. Using the **definition** of convergence of sequence, examine whether the sequence

$\left\{ \frac{3n^2 + \sin n - 4}{2n^2 + 3} \right\}$  is convergent or not. Also, find the limit if it is convergent. [2M]

3.  $S_n = \frac{n}{n^3+1} + \frac{2n}{n^3+2} + \dots + \frac{n^2}{n^3+n}$ ,  $\forall n \in \mathbb{N}$ . Examine whether the sequence

$\{S_n\}$  is convergent or not. Also, find the limit if it is convergent. [2M]

4. For what values of  $p$  does the series  $\sum_{n=1}^{\infty} \frac{n^p}{2+n^3}$  converge? [2M]

5. Does the following series

$$\sum_{n=1}^{\infty} (-1)^n \frac{1}{\sqrt{n^2+1}}$$

[3M]

converge absolutely, converge conditionally, or diverge?

6. Find the series' interval of convergence.

$$\sum_{n=1}^{\infty} \frac{x^n}{n\sqrt{n} 3^n}$$

[2M]

7. Prove that  $\mu\delta = \frac{1}{2}(\Delta + \nabla)$

[1M]

8. Evaluate the integral  $\int_1^2 \frac{e^x}{x} dx$  using  $1/3^{\text{rd}}$  Simpson's rule taking 4 subintervals. Correct up to 3 decimal points.

[2M]

9. Given that  $\sqrt{6500} = 80.6223$ ,  $\sqrt{6510} = 80.6846$ ,  $\sqrt{6520} = 80.7456$  and  $\sqrt{6530} = 80.8084$ . Find  $\sqrt{6526}$  using appropriate interpolation formula if  $f(x) = \sqrt{x}$ . Construct the difference table.

[3M]