IIITS/M3 Exams Date: Sept 2020

Indian Institute of Information Technology, Sri City, Chittoor

Name of the Exam: M3 Mid Examination Duration: 1.5 hrs Max. Marks: 10

Instructions: (Please Read all of them carefully before attempting the questions)

1. Write your Roll No. and Name on top of every page of the answer sheet. It is mandatory.
2. All questions are mandatory.
3. Marks are indicated in [ ] after each question.
4. Rough Work should be done separately, not in the answer sheet.
5. Answers should be reasoned and derived clearly, not a single word answer.
6. You are required to write the answers in A4 sheets.
7. At the end of the exam, you are expected to submit the scanned copy of the answer sheets in pdf format on provided link before the indicated closing time (not beyond 10.30 AM)
8. It is advised to write the answers using the Black pen.
9. Copying in any form will be dealt strictly.

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1. Discuss the convergence of the following sequence using any Sandwich theorem.

$$\lim_{x\to\infty} \frac{2-\cos x}{x+3}.$$

[2]

2. Discuss the convergence of the following series using any suitable tests for series.

$$\sum_{n=1}^{\infty} \frac{2n^3+7}{n^4 \sin^2(n)}$$

(a)

$$\sum_{n=3}^{\infty} \frac{e^{4n}}{(n-2)!}$$

(b)

[1+1]

3. Consider the function $f_n(x) = 1/(1 + x^n)$ for $x \in [0, 1]$
   a) Find $f(x)$ such that $lim_{n\to\infty} f_n(x) = f(x)$.
   b) Show that for $0 < a < 1$, $\{f_n\}$ converges uniformly to f on $[0, a]$ without using the definition.
   c) Show that $\{f_n\}$ does not converge uniformly to f on $[0, \infty)$ using a counter example by taking x as a function of n.

[0.5+1+0.5]

4. Ordinary Differential Equations [2+2]

1) Form the differential equation and classify the equation by its order, degree and linearity for the given equation

   y=$c_1 e^{ax} cosbx + c_2 e^{ax} sinbx$, where a and b are the parameters not to be eliminated

2) Solve the following differential equation

$$x\sin\left(\frac{y}{x}\right)\frac{dy}{dx} = y\sin\left(\frac{y}{x}\right) + x$$