IIITS/M1 Exams Date: Jan 2021

Indian Institute of Information Technology, Sri City, Chittoor

Name of the Exam: M1 mid Examination Duration: 1.5 hrs Max. Marks: 15

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. Preferably use a ballpoint pen. The writing should be readable after scanning. (This is very important)
9. Copying in any form will be dealt strictly.
10. This is a proctored exam. You need to keep your video on throughout the exam.
11. Please note that the total time of the written exam is 1.5 hours including scanning and uploading. You are expected to submit the answer sheet strictly by 1.5 hours. Manage your time accordingly.

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1. Solve the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2}$ with $a_0 = 6$ and $a_1 = 8$.

[2]

2. (a) In how many ways can 5 blue balls, 4 white balls and the rest 6 different colour balls be arranged in a row?
(b) A company has 10 software engineers and 6 civil engineers. In how many ways can a committee of 4 engineers be formed from them such that the committee must contain exactly 1 civil engineer?

[1+1]

3. (a) Prove the following: Let a and b be integers. If $a \geq 2$, then a does not divide one of b and $b + 1$.
(b) Write the negation of the following: "The question paper is not easy and we shall not pass"

[1+0.5+0.5]

4. (i) Define $f : N \to Q$ by $f(x) = \frac{x}{x+1}$
(a) Prove or disprove f is injective
(b) Prove or disprove f is surjecrtive
(ii) If $g(x) = \sqrt{x-3}$ find $g^{-1}(x)$.

[1+1+0.5]

5. (a) Show that $p \to (q \to r)$ is logically equivalent to $(p \wedge q) \to r$ using logical equivalences.
   (b) Find the (a)converse, (b)inverse, and (b)contrapositive of the following implication: If triangle ABC is isosceles and contains an angle of 45 degrees, then ABC is a right triangle.

[1+0.5+0.5+0.5]

6. Prove that $1 \times 1! + 2 \times 2! + ... + n \times n! = (n+1)! - 1$ whenever n is a positive integer.

[2]

7. Define the following function recursively: $f(n) = 2^{(1/3^n)}$, for n=0,1,2,3,..

[2]