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 $a_n = 3a_{n-1} + 4a_{n-2}$ with $a_0 = 5$ and $a_1 = 8$.

[2]

2. (a) In how many different ways can the letters of the word 'DETAIL' be arranged such that the vowels must occupy only the odd positions?
(b) A question paper has two parts P and Q, each containing 10 questions. If a student needs to choose 8 from part P and 4 from part Q, in how many ways can he do that?

[1+1]

3. (a) Prove the statement: For all integers a, b, and c, if $a^2 + b^2 = c^2$, then a or b is even.
(b) Write the negation of the following: "If Sandra finishes her work, she will go to the basketball game."

[1.5+0.5]

4. (a) If $f(x) = 3x - 5$ and $g(x) = 2x^2 - 7x$ find $g \circ f(x)$
(b) Find $h^{-1}(x)$ where $h(x) = \frac{x+4}{2x-5}$.
(c) Find $h^{-1}(10)$.

[1+1+0.5]

5. (i) Using predicate symbols and appropriate quantifiers, write the symbolic form of the following English statement: D(x) is x is a day; S(x) is x is sunny; R(x) is x is rainy.
   (a) Some days are sunny and rainy
   (b) It is always a sunny day only if it is a rainy day.
   (c) Every day that is rainy is not sunny.
   (ii) Use the logical equivalences to show that $p \rightarrow (q \vee r)$ is equivalent to $(p \wedge \neg q) \rightarrow r$.

[0.5+0.5+0.5+1]

6. Prove that 3 divides $n^3 + 2n$ whenever n is a positive integer.

[2]

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

[2]