

2112E073

DIPLOMA OF VOCATION (T.E)
Subject: Applied Mathematics-I
Subject Code: MTH-301
Semester: First
December 2021
Theory (External): 70 Marks
Time: 3 Hours

8. Find the domain and range of the following function: $f(x) =$

$$\frac{1}{\sqrt{x^2+2x-15}}$$

==END OF PAPER==

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of short/objective type in nature. All questions are compulsory. Each question carries 2 marks.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 10 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

Roll Number

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SECTION -A (SHORT/OBJECTIVE TYPE QUESTIONS)
(10x2=20 Marks)

1. If $A = 30^\circ$ and $B = 45^\circ$. Then find $\tan(A - B)$.
2. Reduce the following equation in intercept form and also find the x-intercept and y-intercept

$$2x - 3y = 7.$$

3. How many three digits odd numbers can be formed from the digits 1,2,5,6,8 and 0, where repetition of digits is allowed?
4. Compute 101^5 .
5. Write the first five terms of the sequence a_n , where $a_1 = a_2 = 1$, $a_n = a_{n-1} + a_{n-2}$ for all $n > 2$.
6. Prove that $\cos\left(\frac{\pi}{4} + x\right) + \cos\left(\frac{\pi}{4} - x\right) = \sqrt{2} \cos x$.
7. Write the following sets in roster form:
 - (i) $A = \{x : x \text{ is a month of a year not having 31 days}\}$
 - (ii) $B = \text{The set of all letters in the word TRIGONOMETRY.}$
8. Define Polynomials.
9. Check whether the relation g , defined by

$$g(x) = \begin{cases} x^2 & 0 \leq x \leq 2 \\ 3x & 2 \leq x \leq 10 \end{cases}$$

Is a function or not?

10. If $\frac{1}{6!} - \frac{1}{7!} = \frac{x}{8!}$. Then find the value of x .

SECTION -B (ESSAY TYPE QUESTIONS)
(5x10=50 Marks)

1. Show that $9^{n+1} - 8n - 9$ is always divisible by 64, for all $n \in \mathbb{N}$.
2. Prove that:

$$(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \frac{x+y}{2}$$

3. Find the number of words with or without meaning which can be made using all the letters of the word AGAIN. If these words are written as in dictionary, what will be the 54th word?
4. Find the distance of the line $4x + 7y = -5$ from the point (1,1) along the line $y = x$.
5. If three lines whose equations are $y = m_1x + c_1$, $y = m_2x + c_2$ and $y = m_3x + c_3$ are concurrent, then show that $m_1(c_2 - c_3) + m_2(c_3 - c_1) + m_3(c_1 - c_2) = 0$.
6. In a survey of 70 students, it was found that 35 students read Hindi, 36 read Tamil, 36 read Sanskrit, 19 read both Hindi and Sanskrit, 21 read both Hindi and Tamil, 18 read both Tamil and Sanskrit and 13 read all three languages. Find the number of students who read exactly two scripts.
7. The ratio of the A.M. and G.M. of two positive numbers a and b , is $m : n$. Show that $a : b = (m + \sqrt{m^2 - n^2}) : (m - \sqrt{m^2 - n^2})$