

210156

DIPLOMA OF VOCATION
Industrial Electronics
Subject: Applied Mathematics-I
Subject Code: MTH-301
Semester: First
January 2021
Theory (External): 70 Marks
Time: 03 Hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of 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 (OBJECTIVE TYPE QUESTIONS)

(10x2=20 Marks)

- A The number of elements in the power set of the set $\{\{1,b\},\{c\},2,3\}$ is
a) 8 b) 4 c) 3 d) 7
- B In a school there are 20 teachers who teach mathematics or physics. Of these, 12 teach mathematics and 4 teach both mathematics and physics. How many teachers teach physics?
a) 8 b) 11 c) 12 d) 9
- C Relation between Arithmetic Mean (A.M.), Geometric Mean (G.M.), and Harmonic Mean (H.M.) is:
a) $A.M. = \left(\frac{G.M + H.M.}{2} \right)$
b) $G.M. = \sqrt{A.M \times H.M.}$
c) $G.M. = (A.M \times H.M.)^2$
d) $H.M. = \frac{A.M.}{G.M.}$
- D $1 - \frac{1}{2} + \frac{1}{4} - \frac{1}{8} + \dots \dots \infty$ is equal to
a) 0 b) 2/3 c) 2/5 d) 3
- E If $\frac{1}{x(x-1)} = \frac{P}{x} + \frac{1}{x-1}$, then value of P:
a) 1 b) 0 c) 2 d) -1
- F The income of a person is Rs. 3,00,000 in first year and every year he gets an increment of Rs. 10,000 for next 19 years. The income at the end of 20th year is:
a) Rs. 79,00,000
b) Rs. 80,00,000
c) Rs. 78,00,000
d) Rs. 75,00,000

G $\sin 270^\circ + \cos 270^\circ$ is equal to
a) 0 b) 1.5 c) 2 d) None of these

H Choose the correct formula

a) $\sin A = 3 \sin \frac{A}{3} - 4 \sin^3 \frac{A}{3}$

b) $\sin A = \sin A/2 \cos A/2$

c) $\sin 2A = 3 \sin A \cos A$

d) $\sin 2A = \sin^2 A \cos^2 A$

I The polar coordinate of the point $P = (1,1)$ is:

a) $(2, 30^\circ)$

b) $(\sqrt{2}, 45^\circ)$

c) $(\frac{1}{2}, 90^\circ)$

d) $(2, 60^\circ)$

J Slope of line passing through the points $(-3, -2)$ and $(1, 2)$ is:

a) 1

b) 2

c) -2

d) -1

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

Q1 If $f: R \rightarrow R$ then draw the graph of the function

(i) $f(x) = 2 + x^2$

(ii) $f(x) = |x+1| + |x-1|$

Q2 (i) The sum of three numbers in a Geometric Progression is 24.5 and their product is 343. Find the numbers.
(ii) The sum of n terms of two arithmetic progressions are in the ratio $(3n+8):(7n+15)$. Find the ratios of their 12th terms.

- Q3 (i) Find the number of words, with or without the meaning, which might be formed by using the letters from the word MONDAY. Note that, repetition of the word is restricted, if
- At a time, 3 letters can be used.
 - All the letters can be used at a time.
 - First letter is a vowel and all the letters are being used.
- (ii) If the coefficients of $(r-5)^n$ and $(2r-1)^n$ terms are same in the expansion of $(1+x)^{34}$. Find the value of r .
- Q4 Prove that $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$.
- Q5 (i) Find the equation of line passing through the points $(1, 2)$ and $(3, 5)$.
Also find the slope of perpendicular line to it?
- (ii) Find the distance between the lines $4x + 3y - 9 = 0$ and $4x - 3y + 9 = 0$?
- Q6 Decompose the following in to the partial fraction:
- $$\frac{x^5 - 2x^4 + x^3 + x + 5}{x^3 - 2x^2 + x - 2}$$
- Q7 i) Prove that $\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}$.
- ii) Let L be the set of all lines in a plane and R be the relation on L defined as $R = \{(L_1, L_2) : L_1 \text{ is perpendicular to } L_2\}$. Show that R is symmetric but neither reflexive nor transitive.
- Q8 i) Find the value of x for which the points $(x, -1), (2, 1)$ and $(4, 5)$ are collinear?
- ii) If the angle between two lines is $\frac{\pi}{4}$ and slope of one of the lines is $\frac{1}{2}$.
Find the slope of other line.

*****END OF PAPER*****