

**DIPLOMA OF VOCATION**  
**Mechanical-Manufacturing**  
**Subject: Applied Mathematics-1**  
**Subject Code: MTH-301**  
**Semester: First**  
**December 2019**  
**Theory (External): 70 Marks**  
**Time: 03 hours**

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**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  $\{\{a,b\},c,d\}$  is  
a) 8      b) 4      c) 3      d) 7
- B A college awarded 38 medals in football, 15 medals in basketball and 20 medals in cricket. If these medals are given to 58 players and all the three sport medals are given to three players only. How many players got the exactly two of the three sports medals?  
a) 8      b) 4      c) 5      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  $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots \dots \infty$  is equal to  
a) 0      b) 1.5      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 If  ${}^n C_3 = {}^n C_{12}$ , then value of  $n$  is  
a) 13      b) 11      c) 14      d) 15

- G  $\sin 150^\circ + \cos 150^\circ$  is equal to  
a) 0      b) 1.5      c) 2      d) None of these
- H Choose the correct formula  
a)  $\sin A = 2\sin A/2 \cos A/2$   
b)  $\sin 2A = \sin A \cos A$   
c)  $\sin 2A = 3\sin A \cos A$   
d)  $\sin 2A = \sin^2 A \cos^2 A$
- I The polar coordinate of the point  $P = (2, 2)$  is:  
a)  $(2, 30^\circ)$   
b)  $(2\sqrt{2}, 45^\circ)$   
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)  $f(x) = |x + 2|$
- Q2 (i) The sum of three numbers in a Geometric Progression is 26 and their product is 216. 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 12<sup>th</sup> 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) Find the coefficient of  $x^5$  in the expansion of  $(1+2x)^6(1-x)^7$
- Q4 Prove that  $\tan 4x = \frac{4 \tan x(1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$
- Q5 (i) Find the equation of line passing through the points  $(1, -1)$  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 into partial fractions:
- $$\frac{x^5 - 2x^4 + x^3 + x + 5}{x^3 - 2x^2 + x - 2}$$
- Q7 i) Prove that  $\cos 2x \cos \frac{x}{2} - \cos 3x \cos \frac{9x}{2} = \sin 5x \sin \frac{5x}{2}$ .
- ii) In a group there are 40 people, 17 speak Hindi and 08 can speak both Hindi and English. How many people can speak English only?
- Q8 i) Find the value of  $x$  for which the points  $(x, -1), (2, 1)$  and  $(4, 5)$  are collinear?
- ii) If  $a\left(\frac{1}{b} + \frac{1}{c}\right), b\left(\frac{1}{c} + \frac{1}{a}\right), c\left(\frac{1}{a} + \frac{1}{b}\right)$  are in A.P., Prove that  $a, b, c$  are in A.P.?

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