



## HARYANA VISHWAKARMA SKILL UNIVERSITY

Roll No.....

Name of the Course : B.Sc. (Automotive Mechatronics)

Name of the Subject : Applied Mathematics

Semester : First

Subject Code : BSC-101

Duration : 3 Hours

Maximum Marks : 70

**Instruction:** This question paper consists of 2 Sections.

**Section (A)** comprises 10 questions of objective type in nature. All 10 questions are compulsory. Each question carries 2 marks.

**Section (B)** comprises 6 long answer type questions. Students are required to answer any 5 questions out of these 6 questions. Each question carries 10 marks.

**SECTION-A (OBJECTIVE TYPE QUESTIONS)**

Q1. The number of elements in the power set of the set  $\left\{1, \sqrt{3}, \frac{1}{7}, -4\right\}$  is

- A) 8
- B) 14
- C) 23
- D) 16

Q2. In how many ways can the letters of the word 'LEADER' be arranged?

- A) 360
- B) 144
- C) 72
- D) 500

Q3. If  ${}^n C_{12} = {}^n C_3$ , then value of  $n$  is

- A) 14
- B) 15
- C) 16
- D) 17

Q4.  $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = ?$

- A)  $-\frac{1}{2}$
- B)  $\frac{\sqrt{3}}{2}$
- C)  $-1$
- D)  $1$

Q5.  $450^\circ$  is equal to

- A)  $\frac{5\pi}{6}$  radians
- B)  $\frac{2\pi}{3}$  radians
- C)  $\frac{5\pi}{2}$  radians
- D)  $180\pi$  radians

Q6. What is the value of  $a$  if  $\begin{vmatrix} 1 & 1 & 2 \\ a & 2 & 4 \\ 2 & 3 & 1 \end{vmatrix} = 0$ ?

- A) 5
- B) 1
- C) 7
- D) 2

Q7. If  $y = \sec(x^4 + 9)$  then  $\frac{dy}{dx}$  is

- A)  $4x^3 \cos(x^4 + 2)$
- B)  $-\cos(x^2 + 2) \cot(x^2 + 2)$
- C)  $4x^3 \sec(x^4 + 9) \tan(x^4 + 9)$
- D)  $x^4 \cos(x^4 + 2)$

Q8. If  $f(x) = x \cos x$ , then  $f'(0) = ?$

- A) -1
- B) 0
- C) 1
- D)  $\infty$

Q9.  $\int \left( \sqrt{x} - \frac{1}{\sqrt{x}} \right) dx = ?$

- A)  $\frac{2}{3}x^{3/2} - 2x^{1/2} + c$
- B)  $\frac{2}{3}x^{3/2} - 2x^{-1/2} + c$
- C)  $x^{3/2} + x^{1/2} + c$
- D)  $x^{3/2} - x^{-1/2} + c$

Q10.  $\int_{\frac{1}{\sqrt{3}}}^1 \left( \frac{dx}{1+x^2} \right) = ?$

- A)  $\frac{\pi}{3}$
- B)  $\frac{\pi}{4}$
- C)  $\frac{\pi}{12}$
- D)  $\frac{\pi}{2}$

**SECTION-B (LONG ANSWER TYPE QUESTIONS)**

Q1. (i) Find the range and domain of the given real function:  $f(x) = \sqrt{4-x^2}$ .

(ii) If  $f: R \rightarrow R$  then draw the graph of the function  $f(x) = x^2 - 3$ .

Q2. (i) Find the number of words, with or without the meaning, which might be formed by using the letters from the word SUNDAY. Note that, repetition of the word is restricted, if

- a) At a time, 3 letters can be used.
- b) All the letters can be used at a time.
- c) First letter is a vowel and all the letters are being used.

(ii) Find the Coefficient of  $x^4$  in the expansion of  $(x+1)^7$ .

Q3. Prove that  $\tan 4x = \frac{4 \tan x(1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$ .

Q4. Solve the following equations by Cramer's rule

$$-x + z = 0$$

$$2x + z = 1$$

$$-3y + 6z = 1.$$

Q5. If  $y = \tan x$ , prove that  $\frac{1}{2y} \left( \frac{d^2 y}{dx^2} \right) = \frac{dy}{dx}$ .

Q6. Solve the followings:

(i)  $\int e^{2x} \cos x \, dx$ .

(ii)  $\int \sin \sqrt{x} \, dx$ .

‘END OF PAPER’