

B.Voc. Automotive Mechatronics**Subject: Applied Mathematics****Subject Code: ZBSC101****Semester: 2nd (Regular)****Batch: 2018-21****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)

1. If $A = \{x : x \text{ is a natural number}\}$ and $B = \{2x : x \text{ is a real number}\}$ then find $A \Delta B$.
2. If there are 10 persons in a party and if each of two of them shake hands with each other, how many hands shakes happen in the party?
3. Find coefficient of x^5 in $(x + 3)^8$.
4. Find the value of $(\sin 110^\circ - \sin 70^\circ)$
5. Find the value of $\sin 2x$ if $\sin x = \frac{4}{5}$
6. Find the cofactor of -2 and minor of 4 in the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -2 & 2 \\ 1 & 2 & 4 \end{bmatrix}$.
7. Solve the following for x and t
$$\begin{bmatrix} x & 1 \\ 2 & t \end{bmatrix} + \begin{bmatrix} 3x & 1 \\ 2 & 2t \end{bmatrix} = \begin{bmatrix} 4 & 2 \\ 4 & 3 \end{bmatrix}$$
8. Find the derivative of the function $x^x + a^{2x} + e^{3x} + \cos\sqrt{x}$ with respect to x .
9. Evaluate the integral: $\int (x^{\frac{3}{2}} + \frac{a}{x} + e^{-a} + a^x) dx$.
10. Evaluate the integral $\int_1^{\sqrt{3}} \frac{dx}{1+x^2}$

SECTION -B (ESSAY TYPE QUESTIONS)

(5x10=50 Marks)

- In a school 50 teachers either taught Mathematics or Physics, out of which 14 teachers teach Mathematics and 10 teach both Mathematics and Physics. Find how many teachers teach Physics?
- (a) How many 4 digits number can be formed using 0 to 9 digits, provided digits are not repeated?

(b) From a pack of 52 cards, four cards are to be selected. Find the following

 - Four cards are chosen of same suit
 - Two cards are black and two are red.
- (a) tower stands vertically on the ground. From a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the tower is found to be 60° . Find the height of the tower.

(b) Prove that $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$.
- Prove that $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$.
- Find the term independent of x in the expansion $\left(\frac{3}{2}x^2 - \frac{1}{3x}\right)^6$. Also find 2nd term from the beginning and 3rd term end in the given expansion. Write the total number of terms in the expansion.
- (a). Find the inverse of matrix $\begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$.

(b) Solve the system of equation by Cramer's rule

$$2x + 5y = 1, \quad 3x + 2y = 7.$$

7. (a) Find the derivative of the following functions.

(i) $\sin(\cos x^2)$

(ii) (ii) If $x = at^2, y = -2at$; then find $\frac{dy}{dx}$

(b) Find $\frac{dy}{dx}$ if $y^x + x^y = a^b + e^y$.

8. Evaluate the following integrals

(i) $\int \sin^3 x \cos^2 x \, dx$

(ii) (ii) $\int e^x x^2 \, dx$

(iii) (iii) $\int_0^1 \frac{\tan^{-1} x}{1+x^2} \, dx$ (iv) $\int_3^{10} \frac{x \, dx}{(x+1)(x+2)}$

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