



SHRI VISHWAKARMA SKILL UNIVERSITY

(A State Skill University, setup by an Act of Legislature in 2016)

187023

Course : B.Voc. Robotics and Automation
Subject : Applied Mathematics
Subject Code : ZBSC-101
Semester : First
Duration : 3 Hours
Maximum Marks : 70

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. Define Quadratic function with example.
2. State Binomial Theorem.
3. Prove the identity $(1 - \cos^2 A) \operatorname{cosec}^2 A = 1$
4. Evaluate $\sin 60^\circ \cos 30^\circ + \cos 30^\circ \sin 60^\circ$
5. If $A = \begin{bmatrix} 2 & 4 \\ -10 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & 9 \\ 7 & 8 \end{bmatrix}$. Find AB
6. Find the determinant of the matrix $A = \begin{bmatrix} 2 & 1 & -1 \\ 3 & 2 & 4 \\ -1 & 3 & 2 \end{bmatrix}$
7. Find the derivative of $f(x) = (\sin x)^2$
8. Find the derivative of $f(x) = x^2 + x + 4$
9. Evaluate the integral $\int (\sin x + x^5) dx$
10. Evaluate the integral $\int x(2x^2 + 5)^4 dx$ by the method of substitution

SECTION -B (ESSAY TYPE QUESTIONS)

1. (5x10=50 Marks)
 (a) For the set $A = \{a, b, c\}$, $B = \{b, d, e\}$ and $C = \{a, d\}$. Verify that $A \times (B \cup C) = (A \times B) \cup (A \times C)$
2. (b) How many numbers can be formed using digits 1, 2, 3, 9 if repetition is not allowed.
 (a) A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. find the height of tree.
3. (b) Verify the formula: $\frac{\cos(3x) - \cos(x)}{\cos(x) + \cos(3x)} = -\tan(2x) \tan(x)$.
 (a) Solve the equations $x + y + z = 11$, $2x - 6y - z = 0$, $3x + 4y + 2z = 0$ by Cramer's rule.
 (b) Find the inverse of the matrix $\begin{bmatrix} 3 & -3 \\ 2 & -3 \end{bmatrix}$ by the adjoint method.

4. (a) Find the derivative of $f(x) = \sqrt{3x^2 - x}$ using chain rule .
(b) Find the derivative of $f(x) = \sqrt{\frac{1+\cos x}{1-\cos x}}$.
5. (a) Solve $\int (2x - 3) \cos x \, dx$ by integrating by parts .
(b) Evaluate the integral $\int_{-1}^{-2} \left(\frac{16-x^3}{x^3}\right) dx$.
6. (a) For the matrices $A = \begin{bmatrix} 3 & 2 \\ -1 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ 3 & 6 \end{bmatrix}$ show that $(A + B)^2 = A^2 + AB + BA + B^2 \neq A^2 + 2AB + B^2$.
(b) Expand the expression $\left(x + \frac{1}{x}\right)^6$ by using the binomial expression .
7. (a) Using the property of determinants , prove that $\begin{vmatrix} 0 & a & -b \\ -a & 0 & -c \\ b & c & 0 \end{vmatrix} = 0$.
(b) Differentiate the function $f(x) = \sin(\cos x^2)$.
8. (a) Evaluate $\int x \sin x \, dx$ by the method of integration parts .
(b) Evaluate $\int (4x^2 - 1)8x \, dx$.

-----End of Paper-----