

BACHELOR OF VOCATION
Tool and Die Manufacturing
Subject: Applied Mathematics
Subject Code: ZBSC-101
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									

SECTION –A (SHORT/OBJECTIVE TYPE QUESTIONS)
(10x2=20 Marks)

- A. What do you understand by the term SET? Explain with the help of an example.
- B. Calculate the following
1. ${}^{10}C_6$
 2. 7P_3 .
- C. Find the value of $\sin x$, if $\cos x = \frac{-3}{5}$ and x lies in the 3rd quadrant.
- D. Find the value of $\sin 15^\circ$.
- E. Construct 2×2 matrix, $A = [a_{ij}]$ whose elements are given by $a_{ij} = \frac{(i+j)^2}{2}$.
- F. Evaluate the determinant
- $$\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix}.$$
- G. Differentiate the function $f(x)$ with respect to x ,
 $f(x) = \cos(\sin x)$.
- H. Differentiate the function $f(x)$ with respect to x ,
 $f(x) = \frac{1}{x^2}$.
- I. Evaluate the integral
- $$\int x^2 \left(1 - \frac{1}{x^2}\right) dx.$$
- J. Evaluate the integral
- $$\int_1^2 (4x^3 - 5x^2 + 6x + 9) dx.$$

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

1. (a) There are 200 individuals with a skin disorder, 120 had been exposed to chemical C_1 and 50 had been exposed to chemical C_2 . And 30 had been exposed to both the chemicals C_1 and C_2 . Find the number of individuals exposed to
 - i. Chemical C_1 but not chemical C_2
 - ii. Chemical C_2 but not chemical C_1
 (b) Expand the following expression using binomial expression
 $(2x + 6)^6$
2. (a) Prove that

$$\frac{\sin(x+y)}{\sin(x-y)} = \frac{\tan x + \tan y}{\tan x - \tan y}$$
 (b) Show that

$$\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$$
3. (a) Show that the matrix $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$ satisfies the equation $A^2 - 4A + I = 0$, Where I is 2×2 identity matrix and 0 is 2×2 zero matrix.
 (b) Find the determinant of the following matrices
 - a) $\begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$
 - b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 4 \end{bmatrix}$
4. (a) Differentiate with respect to x ,

$$Y = \frac{\cos x}{\log x}$$
 (b) If $Y = 500e^{7x} + 600e^{-7x}$. Then show that $\frac{d^2y}{dx^2} = 49Y$
5. (a) Evaluate the integral

$$\int \left(\frac{1}{x + \log x} \right) dx$$
 (b) Evaluate the integral

$$\int x e^x dx$$

6. Solve the following system of linear equations using Cramer's rule.

$$x + 2y + 3z = 2$$

$$x + z = 3$$

$$x + y - z = 1$$

7. (a) Differentiate the following function with respect to x

$$\sqrt{3x+2} + \frac{1}{(2x^2+4)}$$

- (b) Evaluate the integral

i. $\int e^{2x} dx$

ii. $\int \left(\frac{x^3 - x^2 + x - 1}{x-1} \right) dx$

8. (a) In a survey of 60 people, it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper K, 9 read both H and K, 11 read both H and T, and 8 read both T and K, 3 read all the three newspapers. Find the number of the people who read at least one of the newspapers.

- (b) In a committee 50 people speak Hindi, 20 people speak English and 10 speak both Hindi and English. Find how many people speak at least one of these two languages.

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