DIPLOMA OF VOCATION
Industrial Electronics
Subject: Mathematics II
Subject Code: ZDSC-104
Semester: Second
October 2020
Theory (External): 70 Marks
Time: 03 Hours

INSTRUCTIONS TO THE STUDENTS

1. Read the questions carefully and write the answers in the answer sheets.

2. Wherever necessary, the diagram drawn should be neat and properly labelled.

3. This questions paper comprises of 8 questions out of which student need to attempt any 4 questions.

4. All questions carry equal marks.

5. The time allotted will be 3 hours for examinations including time of downloading of question paper to emailing of answer books to the concerned Dean/IC.

ESSAY TYPE QUESTIONS

1. (i) let $A = \{1,2,3,4\}$, $B = \{1,5,9,11,15,16\}$;
   $f = \{(1,5),(2,9),(3,1),(4,5),(2,11)\}$
   Check (a) f is a relation from A to B (b) f is a function from A to B.
   Also justify your answer.

   (ii) Consider $f : R \to R$ given by $f(x) = 4x + 3$. Show that f is invertible and also find its inverse.

2. (i) Evaluate $\lim_{x \to 0} \dfrac{ax + x \cos x}{b \sin x}$.

   (ii) Integrate $\int \dfrac{e^{\tan^{-1} x}}{1+x^2}$.

3. (i) If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$. Find $A^2 - 5A + 6I$.

   (ii) A bag contains 10 red ,20 blue and 30 green balls. 5 balls are drawn at random from the bag, what is then probability that (a) all will be blue (b)at least one will be green.

4. (i) Show that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$ and $3\hat{i} - 4\hat{j} - 4\hat{k}$ form the vertices of right angle triangle.

   (ii) Find a vector in the direction of vector $5\hat{i} - \hat{j} + 2\hat{k}$,which has magnitude 8 units.

5. Find the (a) coordinate of foci (b) vertices (c) length of major axis and minor axis (d) eccentricity and (e) length of latus rectum for the ellipse $x^2 + 16y^2 = 16$.

6. Check the function f defined by $f(x) = \begin{cases} x, & if\ x \leq 1 \\ 5, & if\ x > 1 \end{cases}$ is continuous at $x = 0, x = 1\ and\ x = 2$.

7. If $\frac{(1+i)^2}{2-i} = x + iy$, then find the value of x+y,x-y.

8. Given $3\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix}$ .find the value of x,y,z and w.

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