Enrolment No. 21[illegible]

S_3 (All): MA

B.Tech. 3rd SEMESTER MID TERM EXAMINATION – 2022-23

SUBJECT NAME: Engineering Mathematics-III/Mathematics-III

SUBJECT CODE: UCE03B14/UME03C14/UEE03C17/UCS03C16/UEC03C15/ UEE13C01/UPE03C16/UCH03C18/UBE03C03

Full Marks: 20 **Time: 1 Hour**

Symbols used here have their usual meanings

GROUP – A

Answer the following questions: **Marks: 4**

1. Find the value of b_n in the Fourier series expansion of $f(x) = \begin{cases} 0, & if -2 < x < 0 \\ 1, & if\ 0 < x < 2 \end{cases}$.
2. If X is a random variable, then for what value of k, $f(x) = \begin{cases} ke^{-2x}, x \geq 0 \\ 0, otherwise \end{cases}$, to be density function.
3. State Bayes' Theorem.

$[2 + 1 + 1] = 4$

GROUP – B

Answer the following questions: $[2 \times 4] = 8$

1. Expand $f(x) = \sqrt{1 - cosx}$, $0 < x < 2\pi$ in a Fourier series.
2. Obtain Fourier series for the function $f(x)$ given by $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, if -\pi \leq x \leq 0 \\ 1 - \frac{2x}{\pi}, if\ 0 \leq x \leq \pi \end{cases}$. Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\pi^2}{8}$

GROUP – C

Answer the following questions: $[2 \times 4] = 8$

1. In a factory, machines A and B are producing springs of the same type. Of these productions machines A and B produces 5% and 10% defective springs respectively. Machines A and B produces 40% and 60% of the total output of the factory. One spring is selected at random and it is found to be defective. What is the possibility that this defective spring was produced by machine A?
2. A random variable X has the following probability distribution:

x:	0	1	2	3	4	5	6	7	8
$p(x)$:	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$	$15k$	$17k$

(i) Determine the value of k.

(ii) Find $P(X < 3)$ and $P(0 < X < 5)$.

(iii) Find the distribution function of X.

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