Total No. of Questions : 4]

SEAT No. : ____

PA-1678

[Total No. of Pages : 2

[5931]-1001

F.E.

ENGINEERING MATHEMATICS-I

(2019 Pattern) (Semester-I) (107001)

Time : 1 Hour] ***[Max. Marks : 30***

Instructions to the candidates:

1) ***Attempt Q1 or Q2 and Q3 or Q4.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data wherever necessary.***
4) ***Use of electronic pocket calculator is allowed.***

Q1) a) If $f(x)=\sin^{-1}x$ then show that $\frac{b-a}{\sqrt{1-a^2}} < \text{Sin}^{-1}b - \sin^{-1}a < \frac{b-a}{\sqrt{1-b^2}}$ where $0<a<b<1$. **[5]**

b) Using Taylor's theorem, expand $1+2x+3x^2+4x^3$ in powers of $x+1$ **[5]**

c) Evaluate $\lim_{x\to\frac{\pi}{2}} (\text{Cos}\, x)^{\text{COS}\, x}$ **[5]**

OR

Q2) a) Expand $\sqrt{1+\sin x}$ upto x^4 in ascending powers of x **[5]**

b) Expand logcosx in ascending powers of $\left(x-\frac{\pi}{3}\right)$ upto the term in $\left(x-\frac{\pi}{3}\right)^2$ by using Taylor's theorem. **[5]**

c) Find the values of a and b if $\lim_{x\to 0}\frac{\sin x + ax + bx^3}{x^3} = 0$ **[5]**

Q3) a) Find Fourier series for $f(x)=\left(\frac{\pi - x}{2}\right)^2, 0<x<2\pi$ and $f(x)=f(x+2\pi)$ **[5]**

b) Find half-range sine series for **[5]**

$f(x)=2x-1,\ 0<x<1$

P.T.O.

c) Obtain the constant term and the coefficients of the first sine and cosine term in the fourier series of $f(x)$ as given in the following table. **[5]**

x	0	1	2	3	4	5
y	9	18	24	28	26	20

OR

Q4) a) Find the fourier series to represent **[5]**

$$f(x)=\begin{cases}-3, & -1<x<0\\ 3, & 0<x,<1\end{cases},\ f(x)=f(x+2)$$

b) Find half-range consine series for $f(x) = x^2, 0 < x < \pi$ **[5]**

c) Find half-range sine series for $f(x) = 1,\ 0 < x < \pi$. Hence using parsevals identify, deduce that **[5]**

$$\frac{\pi^2}{8}=1+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+.....$$