

Total No. of Questions : 4]

PA-1678

SEAT No. :

[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 $\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1}b - \sin^{-1}a < \frac{b-a}{\sqrt{1-b^2}}$ 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 $\lim_{x \rightarrow \frac{\pi}{2}} (\cos x)^{\cos x}$ [5]

OR

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

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

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

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

- 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]

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