Total No. of Questions : 4]

SEAT No. : ____

P1268

[Total No. of Pages : 2

OCT/FE/INSEM-1
F.E. (Phase - I)
ENGINEERING MATHEMATICS - I
(2019 Pattern)

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

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2 and Q.3 or Q.4.***
2) ***Use of electronic pocket calculator is allowed.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

Q1) a) For 0 < a < b, show that **[5]**

$$\left(\frac{b-a}{b}\right) < \log\left(\frac{b}{a}\right) < \left(\frac{b-a}{a}\right)$$

Hence show that $\frac{1}{4} < \log\left(\frac{4}{3}\right) < \frac{1}{3}$

b) By using Taylor's theorem, expand $f(x) = e^x$ in powers of $(x-2)$. **[5]**

c) Evaluate $\lim_{x\to 0}\left(\frac{a^x + b^x}{2}\right)^{1/x}$ **[5]**

OR

Q2) a) Prove that $\log(1+\tan x) = x - \frac{x^2}{2} + \frac{2}{3}x^3 - - -$ **[5]**

b) Expand $7+(x+1)+3(x+1)^3+(x+1)^4$ in ascending powers of x by using Taylor's theorem. **[5]**

c) Find a and b if

$$\lim_{x\to 0}\left[\frac{a\cos x - a + bx^2}{x^4}\right] = \frac{1}{12}$$ **[5]**

P.T.O.

Q3) a) Find fourier series to represent the function

$f(x) = x$ for $-\pi < x < \pi$ and $f(x) = f(x + 2\pi)$. **[5]**

b) Find half range cosine series for $f(x) = x^2$, $0 < x < 2$. **[5]**

c) Obtain constant term and coefficients of the first sine and cosine terms in the Fourier expansion of y as given in the following table. **[5]**

(Given $f(x) = f(x + 2\pi)$)

x	0	$\frac{\Pi}{3}$	$\frac{2\Pi}{3}$	Π	$\frac{4\Pi}{3}$	$\frac{5\Pi}{3}$
y	1.0	1.4	1.9	1.7	1.5	1.2

OR

Q4) a) Find Fourier series for the function $f(x) = x^2 - 2, -2 \le x \le 2$ and $f(x) = f(x + 4)$. **[5]**

b) Find half-range sine series for $f(x) = \Pi x - x^2$ where $0 < x < \Pi$. **[5]**

c) Find first three terms in cosine series to represent y as given in the following table. **[5]**

x	0	1	2	3	4	5
y	4	8	15	7	6	2

❍❍❍