

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 $\lim_{x \rightarrow 0} \left(\frac{a^x + b^x}{2}\right)^{\frac{1}{x}}$

[5]

OR

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

[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

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

[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 $f(x) = x^2 - 2, -2 \leq x \leq 2$ 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

