Total No. of Questions : 4]

SEAT No. :

PC373

[Total No. of Pages : 2

[6358]-101

F.E. (Insem)

ENGINEERING MATHEMATICS - I

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

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

Instructions to the candidates:

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

Q1) a) For the functions $f(x)=\sqrt{x}$ and $g(x)=\frac{1}{\sqrt{x}}$, prove that 'C' of Cauchy's mean value theorem is the geometric between a and b where $a, b > 0$. **[5]**

b) Expand $2x^3 + 7x^2 + x - 1$ in powers of $(x - 2)$. **[5]**

c) Find the values of a and b such that $\lim_{x\to 0}\frac{a\sin 2x - b\tan x}{x^3}=1$. **[5]**

OR

Q2) a) Using Lagrange's mean value theorem, prove that, $\frac{b-a}{b} < ln\left(\frac{b}{a}\right) < \frac{b-a}{a}$ for $0 < a < b$. Hence show that, $\frac{1}{4} < ln\left(\frac{4}{3}\right) < \frac{1}{3}$. **[5]**

b) Prove that $e^x \cdot \cos x = 1 + x - \frac{x^3}{3} + ...$ **[5]**

c) Evaluate $\lim_{x\to 1}\left[(1-x^2)\right]^{\left[\frac{1}{ln(1-x)}\right]}$. **[5]**

P.T.O.

Q3) a) Find Fourier series to represent the function $f(x) = \pi^2 - x^2 \quad -\pi \le x \le \pi$ and $f(x) = f(x + 2\pi)$ **[5]**

b) Find half range sine series for the function $f(x) = x^2 \quad 0 \le x \le l$. **[5]**

c) The following table gives the variation of periodic current over a period. **[5]**

t sec	0	T/6	T/3	T/2	2T/3	5T/6	T
A amp.	1.98	1.30	1.05	1.3	–0.88	–0.25	1.98

Show by practical harmonic analysis that there is a direct current part of 0.75 ampere in the variable current and obtain the amplitude of the first harmonic.

OR

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

b) Find half range cosine series for $f(x) = x^2 \quad 0 \le x \le \pi$. **[5]**

c) Obtain the first two coefficient in the fourier sine series for y. **[5]**

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