

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 $\lim_{x \rightarrow 0} \frac{a \sin 2x - b \tan x}{x^3} = 1$. [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 $e^x \cdot \cos x = 1 + x - \frac{x^3}{3} + \dots$ [5]

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

P.T.O.

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

b) Find half range sine series for the function $f(x) = x^2$ $0 \leq x \leq l$. [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 $f(x) = x$ $-2 \leq x \leq 2$ & $f(x) = f(x + 4)$. [5]

b) Find half range cosine series for $f(x) = x^2$ $0 \leq x \leq \pi$. [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

