

Total No. of Questions - [6]

Total No. of Printed Pages 2

G.R. No.

U117-101 (T2)

October

SEPTEMBER 2017 / IN - SEM (T2)

F. Y. B.TECH. (COMMON) (SEMESTER - I)

COURSE NAME : Engineering Mathematics I

Time : [1 Hour]

(2017 PATTERN)

[Max. Marks : 30]

Instructions to candidates:

- 1) Answer Q.1 OR Q.2, Q.3 OR Q.4
- 2) Figures to the right indicate full marks.
- 3) Use of scientific calculator is allowed
- 4) Use suitable data where ever required

Q 1) a) Find n^{th} derivative of the function $y = \frac{x^2}{(x+2)(2x+3)}$ [6]

b) $y = a \cos(\log x) + b \sin(\log x)$ then prove that

$$x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$$
 [6]

c) Test whether following functions satisfies Lagrange's Mean Value Theorem

and if so find appropriate value of c where $f(x) = 2x^3 - 7x + 10$, $2 \leq x \leq 5$ [4]

OR

OR Q2) a) Find n^{th} derivative of $y = \cos x \cos 2x \cos 3x$ [6]

b) If $y = \cos(m \log x)$ then prove that

$$x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2 + m^2)y_n = 0$$
 [6]

c) Verify Rolle's theorem for $f(x) = x^2(1-x^2)^2$ in the interval $0 \leq x \leq 1$ [4]

Q3) a) Obtain the range of convergence of the series $\frac{1}{2} + \frac{2}{3}x + \left(\frac{3}{4}\right)^2 x^2 + \left(\frac{4}{5}\right)^3 x^3 + \dots$ [6]

b) Expand $\cos^{-1} \left[\frac{x-x^{-1}}{x+x^{-1}} \right]$ in ascending powers of x. [4]

c) Expand $\tan^{-1} x$ in powers of $(x-1)$ [4]

OR

Q4) a) Prove that $\sec^{-1} \left[\frac{1}{1-2x^2} \right] = 2 \left[n\pi + x + \frac{x^3}{6} + \frac{3x^5}{40} + \dots \right]$ [6]

b) Test the Convergence of the Series $1 - \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} - \frac{1}{4\sqrt{4}} + \dots$ [4]

c) $\sum_{n=1}^{\infty} (\sqrt{n^3+1} - \sqrt{n^3-1})$ [4]