Paper Id: | 180117 | **Roll No:** | | | | | | | | | | | |

B. TECH.
(SEM-I) THEORY EXAMINATION 2019-20
ENGINEERING MATHEMATICS- I

Time: 3 Hours   *Total Marks: 100*

Note Attempt all Sections if require any missing data then choose suitably.

SECTION A

1. **Attempt all questions in brief.**   **10 x 2 = 20**

a) Find the derivative of $y = x^3 - 2x^2 + 4$ with respect to x.

b) Examine the continuity of $f(x) = x^2 - x + 1$ at $x = 1$.

c) If $u = x^2 - y^2$ then find the value of $x \frac{\partial}{\partial x} + y \frac{\partial}{\partial y}$.

d) If $x = r\cos\theta$ and $y = r\sin\theta$ then find $\frac{\partial(\ ,\ )}{\partial(\ ,\ )}$.

e) Define Gamma function.

f) Evaluate $\iint e^{x-y}\, dx\, dy$ over the triangle bounded by x=0, y=0 and x+y = 1.

g) Find order and degree of differential equation $(\frac{}{})^2 + 5y = x$.

h) Find the I.F. of $\frac{}{} + xy = e$.

i) Find the Rank of the matrix $A = \begin{matrix} 1 & 0 & 0 & 1 \\ 0 & 2 & 1 & 3 \end{matrix}$.

j) The Eigen value of matrix A are 1,-2,3 then find the Eigen value of A^3.

SECTION B

2. **Attempt any *three* parts of the following:**   **10 x 3 = 30**

a) Differentiate $(x)^x$ with respect to x.

b) Expand $f(x) = e^{\sin x}$ in powers of $(x - \pi/2)$ by Taylor's theorem

c) Solve $\frac{d^2 y}{dx^2} + 5\frac{dy}{dx} + 6y + \sin 2x + \cos 2x$.

d) Evaluate the area enclosed between the parabola $y = x^2$ and the straight line $y = x$.

e) Find the characteristic equation of the matrix and verify Cayley Hamilton theorem. Hence find A^{-1}.

$$A = \begin{matrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{matrix}$$

SECTION C

3. **Attempt any *two* parts of the following:**   **5 x 2 = 10**

a) Differentiate $\log(ax+b)$ with respect to x.

b) Evaluate $\lim_{\to} \frac{}{}$.

c) Evaluate $\int \frac{}{}\, dx$.

4. **Attempt any *two* parts of the following:**   **5 x 2 = 10**

a) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, Show that $(\frac{}{} + \frac{}{} + \frac{}{})u = 3/(x+y+z)$.

b) What is the degree of homogeneous function $u(x,y) = x^2(x^2-y^2)^{1/3} / (x^2+y^2)^{2/3}$

c) If $y = \frac{}{}, y = \frac{}{}, y = \frac{}{}$, find $\frac{\partial(\ ,\ ,\ )}{\partial(\ ,\ ,\ )}$.

5. **Attempt any** *two* **parts of the following:** **5 x 2 = 10**

a) Evaluate $\iint x\,y\,dx\,dy$ over the positive quadrant of the circle $x^2+y^2 = a^2$.

b) Change the order of integration $\quad dy\,dx \quad$.

c) Prove that $\beta(m, n) = \dfrac{\quad}{(\quad)}$.

6. **Attempt any** *two* **parts of the following:** **5 x 2 = 10**

a) Solve $\quad — = $ x tan y

b) Solve $(D^2\text{-}4D+4)\,y = x^3\,e^{2x}$.

c) Using method of variation of parameter to solve $y'' + y = \sec x$.

7. **Attempt any** *two* **parts of the following:** **5 x 2 = 10**

a) Find inverse of the matrix by using elementary transformation A= $\begin{matrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{matrix}$

b) Find the Eigen values of the following matrix A = = $\begin{matrix} 4 & 3 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & 1 \end{matrix}$

c) Find the rank of the matrix A= $\begin{matrix} 1 & -2 & 5 \\ 4 & -9 & 10 \\ 3 & -6 & 15 \end{matrix}$