

B. TECH.
(SEM-) 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 parts of this question in brief. 10 x 2 = 20**

- a) Find the derivative of $y = x^3 - x^2 + x$ with respect to x .
- b) Evaluate $\int x \cos x \, dx$.
- c) If $x = r \cos \theta$ and $y = r \sin \theta$, then find $\frac{\partial(x,y)}{\partial(r,\theta)}$.
- d) If $u = x^2 + y^2 + 2xy$ then find the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$.
- e) Find the value of $\Gamma(3/2)$.
- f) Evaluate $\beta(1,1) + \beta(2,2)$.
- g) Find the integrating factor (I.F.) of $\frac{dy}{dx} + 2y = e^x$.
- h) Find order and degree of differential equation $(\frac{dy}{dx})^2 + 5y = \sin x$.
- i) Find the sum of eigen values of $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$.
- j) Define singular and nonsingular matrices.

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

- a) Evaluate $\int (\sec^2 x - 2 \sin 3x + \cos 2x) dx$.
- b) If $u = f(e^{y-z}, e^{z-x}, e^{x-y})$, prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
- c) Change the order of the integration and evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dy dx$.
- d) Solve the differential equation $(x+1) \frac{dy}{dx} - y = e^x (x+1)^2$.
- e) Determine 'b' such that the system of homogeneous equation has non-trivial solution. $2x+y+2z=0$, $x+y+3z=0$, $4x+3y+bz=0$.

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

- a) Find the derivative of $\frac{\sin(2x-3)}{\cos(4x-1)}$ with respect to x .
- b) Consider the function $f(x) = \begin{cases} \frac{2x^2+3}{x-3}, & \text{when } x \leq 2 \\ 3x+k, & \text{when } x > 2 \end{cases}$, find the value of k such that $f(x)$ is continuous at $x = 2$.
- c) Evaluate $\int x \log x \, dx$.

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

- a) If $u = x^2 + y^2 + 2xy$, find $\frac{\partial^2 u}{\partial x \partial y}$.
- b) What is the degree of homogeneous function $u(x,y) = x^2(x^2 - y^2)^{1/3} / (x^2 + y^2)^{2/3}$

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c) If $u = xyz, v = xy + yz + zx, w = x + y + z$ then evaluate $\frac{\partial(u, v, w)}{\partial(x, y, z)}$.

5. Attempt any *two* parts of the following:

5 x 2 = 10

- a) Change the order of integration $\int_0^1 \int_0^x dy dx$ and hence evaluate the same.
 b) Evaluate $\iint dx dy$ over the positive quadrant of the circle $x^2 + y^2 = 9$.
 c) Find the area of curve between the line $x = 4$ and a parabola $y^2 = 16x$.

6. Attempt any *two* parts of the following:

5 x 2 = 10

- a) Solve $(x+y-10) dx + (x-y-2) dy = 0$.
 b) Solve $(D^2 - 2D + 2)y = e^x \cos x$.
 c) Solve $\frac{d^2 y}{dx^2} + y = \sec x$.

7. Attempt any *two* parts of the following:

5 x 2 = 10

- a) Find inverse of the matrix by using elementary transformation $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$.
 b) Find the Eigen values of the following matrix $A = \begin{bmatrix} 2 & 3 & 5 \\ 3 & 5 & 6 \\ 5 & 7 & 3 \end{bmatrix}$.
 c) Reduce the matrix into normal form and hence find the rank $A = \begin{bmatrix} 1 & -2 & 5 \\ 4 & -9 & 10 \\ 3 & -6 & 15 \end{bmatrix}$.