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End Term Examination, Odd Semester 2018-19

B.Tech. I Year I Semester,

Engg. Mathematics I (BMAS-0101)

Time: 3 Hour Maximum Marks: 50

Section-A **7 X 5=35 Marks**

Note: Attempt All questions

1. Trace the curve $y^2 = x^3$.

OR

If $v = \log_e \sin\left[\frac{\pi\left(2x^2 + y^2 + xz\right)^{\frac{1}{2}}}{2\left(x^2 + xy + 2yz + z^2\right)^{\frac{1}{3}}}\right]$, prove that when x= 0,

y=1, z=2; $x\frac{\partial v}{\partial x} + y\frac{\partial v}{\partial y} + z\frac{\partial v}{\partial z} = \frac{\pi}{12}$.

2. If $u = x^2 + y^2 + z^2, v = x + y + z, w = xy + yz + zx$, then show that $\frac{\partial(u,v,w)}{\partial(x,y,z)} = 0$. Is u, v, w functionally related ? If so find the relation between them.

3. Find the values of a and b if the equations: x + y + 2 z =2, 2x-y+3z=2, 5x-y+az=b have (i) no solution (ii) unique solution and (iii) infinite number of solutions.

4. Use Cayley - Hamilton theorem to find the matrix

$A^8-5A^7+7A^6-3A^5+8A^4-5A^3+8A^2-2A+I$, if the matrix

$$A=\begin{bmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 1 & 1 & 2\end{bmatrix}.$$

5. Solve the following by the method of variation of parameters:

$$\frac{d^2y}{dx^2}+1=x.$$

6. Solve the following simultaneous differential equations:

$$\frac{d^2y}{dt^2}+x=\cos t \text{ and } \frac{d^2x}{dt^2}+y=\sin t$$

7. Solve the following homogeneous differential equation

$$x^3\frac{d^3y}{dx^3}-3x\frac{dy}{dx}+3y=16x+9x^2\log_e x, x>0.$$

Section-B

Note: Attempt All questions. **3 x 2 = 6 Marks**

1a. Solve the differential equation $\frac{d^3y}{dx^3}-6\frac{d^2y}{dx^2}+11\frac{dy}{dx}-6y=e^{-2x}+e^{3x}$.

1b. Find the solution of $\frac{d^2y}{dx^2}-4\frac{dy}{dx}+3y=\sin 3x\cos 2x$.

1c. Solve $\frac{d^2y}{dx^2}-4y=\cosh(2x-1)+3^x$.

Note: Attempt All questions. **3 x 3 = 9 Marks**

2a. Solve $\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=x^2e^{2x}+\sin^2 x.$

2b. $\frac{d^2y}{dx^2}+4y=\tan 2x$

2c. A spring for which the spring constant k is 700 Newton per meter hangs in a vertical position with its upper end fixed to a support. A mass of 20 kg is attached to the lower end and system brought to rest. Find the position of the mass at time t, if a force 70 sin 2t Newton is applied to the support.