Total No. of Questions : 4]

SEAT No. :

PD1

[Total No. of Pages : 2

[6408]-101

F.E. (Insem)

ENGINEERING MATHEMATICS-II

(2019 Pattern) (Credit System) (Semester-II) (107008)

Time : 1 Hour] *[Max. Marks : 30*

Instructions to the candidates:

1) ***Attempt Q.1 or Q.2 Q.3 or Q.4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam table is allowed.***
5) ***Assume suitable data if necessary.***

Q1) a) Solve $\frac{dy}{dx}=\frac{1+y^2+3x^2y}{1-2xy-x^3}$ **[5]**

b) Solve $\left(3xy^2-y^3\right)dx+\left(xy^2-2x^2y\right)dy=0$ **[5]**

c) Solve $\sec x\tan y\frac{dy}{dx}+\tan x\sec y=\cos^2 x$ **[5]**

OR

Q2) a) Solve $\frac{dy}{dx}+\frac{2x}{1+x^2}y=\frac{3x^2}{1+x^2}$ **[5]**

b) Solve $\frac{dy}{dx}-xy=-y^3e^{-x^2}$ **[5]**

c) Solve $\left(x^4e^x-2mxy^2\right)dx+2mx^2y\,dy=0$ **[5]**

Q3) a) A body is heated to 100ºC & placed in a room whose temperature is 20ºC and cools to 60ºC in 5 minutes. How much time is required for it to cool to 40ºC? **[5]**

P.T.O.

b) A resistance of 150 ohms, an inductance of 0.5 henry are connected in a series with a battery of 30 volts. Find the current in the circuit as a function of t. **[5]**

c) A particle of unit mass moves in a horizontal straight line OA with an acceleration $\frac{'k'}{x^3}$ at a distance 'x' and directed towards 'o'. If initially the particle was at rest at a distance 'a' from o, show that it will be at a distance $\frac{'a'}{2}$ from 'o' at the end of time $\frac{a^2}{2}\sqrt{\frac{3}{k}}$. **[5]**

OR

Q4) a) Find the orthogonal trajectories of the family of curves $r^2 = a\cos 2\theta$. **[5]**

b) A capacitor c = 0.01 farad in a series with a resistor R = 20 ohms is charged from a battery E = 10 volts. Assuming that initially the capacitor is completely uncharged, determine the charge Q (t) and current I (t) in the circuit. **[5]**

c) A pipe 10cm in a diameter contains steam at 200ºC. It is protected with a covering 5cm thick for which k=0.12. If the temperature of outer surface of the covering is 50ºC. How much heat is lost per minute from a portion of the pipe 20 metres long? **[5]**