Total No. of Questions : 4]

SEAT No. :

PF1

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Apr-26/FE/Insem-1

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 and 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 chart, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

Q1) a) Solve $(x+y-2)dx+(x-y+4)dy=0$. **[5]**

b) Solve $(x^2+y^2+x)dx+xydy=0$. **[5]**

c) Solve $(1+y^2)\frac{dx}{dy}+x=e^{-\tan^{-1}(y)}$. **[5]**

OR

Q2) a) Solve $\frac{dy}{dx}-xy=-y^3e^{-x^2}$. **[5]**

b) Solve $\sec^2(y)\frac{dy}{dx}+2x\tan(y)=x^3$. **[5]**

c) Solve $(x^2y-2xy^2)dx+(-x^3+3x^2y)dy=0$. **[5]**

P.T.O.

Q3) a) A body at temperature 80ºC is placed in a room whose temperature is 20ºC and cools to 40ºC in 10 minutes. Find temperature of the body after 15 minutes from begining. **[5]**

b) The charge 'Q' on the plate of a condenser of capacity 'C' charged through a resister 'R' by a steady voltage 'V'. If Q = 0 at time t = 0 show that $Q = CV\,[1 - e^{-t/Rc}]$. Find current flowing into the plate. **[5]**

c) A body of mass *m* falling from rest is subjected to the force of gravity and an air resistance proportional to the square of the velocity (kV^2). If it falls through a distance *x* and posses velocity v at that instant. Prove that

$$\frac{2kx}{m} = \log\left(\frac{a^2}{a^2 - v^2}\right)$$ where, $(mg = ka^2)$. **[5]**

OR

Q4) a) Find orthogonal trajectories of the family of curves given by $x^2 - y^2 = c^2$. **[5]**

b) An electrical circuit consist of a battery E, a resistance R and an inductance L. Find I as a function of *t*. Also find how long will be, before the current (I) reached one half of its maximum value, if E = 6 volts, R = 100 ohms & L = 0.1 henry? **[5]**

c) A long hollow pipe has an inner diameter of 10cm and outer diameter of 20cm. The inner surface is kept at 200ºC and the outer surface at 50ºC. The thermal conductivity k = 0.12. Find the amount of heat lost per second from a centimeter length pipe. Also find heat lost per minute from 10 meter length pipe. **[5]**