Total No. of Questions : 4]

SEAT No. :

**P1**

[Total No. of Pages : 2

# FE/Insem./APR-1
# F.E.
# 107008 : ENGINEERING MATHEMATICS - II
## (2019 Pattern) (Semester - II)

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

***Instructions to the candidates:***

1) ***Attempt Q1 or Q2 and Q3 or Q4.***
2) ***Use of electronic pocket calculator is allowed.***
3) ***Assume suitable data, if necessary.***
4) ***Neat diagram must be drawn wherever necessary.***
5) ***Figures to the right indicate full marks.***

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

b) Solve : $\left(x^2y^2+5xy+2\right)ydx+\left(x^2y^2+4xy+2\right)xdy=0$ **[5]**

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

OR

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

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

c) Solve : $\left[2x\ln x-xy\right]dy+\left[2y\right]dx=0$ [5]

***Q3)*** a) A body is heated to 110 °C and placed in air at 10 °C. After one hour its temperature is 60 °C. How much time is required for it to cool to 30 °C? **[5]**

b) A constant electromotive force E volt is applied to a circuit containing a constant resistance Rohm in series with a constant inductance t henry. If the initial current is zero, show that the current builds upto half its theoretical maximum in $\frac{L}{R}(\ln 2)$ seconds. **[5]**

***P.T.O.***

c) A particle of mass m is projected upwards with velocity $V_0$. Assuming the air resistance k times its velocity, write the equation of motion. Show that it will reach maximum height in time $\left(\frac{m}{k}\right).\ln\left(1+\frac{kV_0}{mg}\right)$. **[5]**

OR

***Q4)*** a) Find orthogonal trajectories of the family of curves given by $xy = C$ **[5]**

b) A circuit consists of resistance Rohm and a condenser of C farad connected to a constant electromotive force E volt. If $\frac{Q}{C}$ is the voltage of the condenser at time t after closing the circuit, show that the voltage at time t is $E\left(1-e^{-t/RC}\right)$. **[5]**

c) A pipe 10cm in diameter contains steam at 100 °C. It is covered with asbestos 5cm thick for which K=0.0006 and the outside surface is at 30°C. Find the amount of heat lost per second from a centimeter length pipe. Also find heat lost per hour from a meter length pipe. **[5]**

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