

Total No. of Questions : 4]

**P1**

SEAT No. :

[Total No. of Pages : 2

**FE/Insem/APR-1**

**R.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 :  $(x^2y^2 + 5xy + 2) y dx + (x^2y^2 + 4xy + 2) x dy = 0$  **[5]**

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

OR

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

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

c) Solve :  $[2x \ln x - xy] dy + [2y] dx = 0$  **[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  $\left(\frac{m}{k}\right) \cdot \ln \left(1 + \frac{kV_0}{mg}\right)$ . **[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  $E(1 - e^{-t/RC})$ . **[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]**