

Total No. of Questions : 4]

SEAT No. :

P1

FE/Insem./APR-1

[Total No. of Pages : 2

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 : $(x^2y^2 + 5xy + 2)ydx + (x^2y^2 + 4xy + 2)xdy = 0$ [5]

c) Solve : $\tan y \cdot \frac{dy}{dx} + \tan x = \cos y \cdot \cos^2 x$ [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 : $[2x \ln x - xy]dy + [2y]dx = 0$ [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 R ohm 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]

