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Total No. of Pages : 3

Seat No.	

F.E. (Part - II) (Semester - II) (New) Examination, April - 2018
ENGINEERING MATHEMATICS -II
Sub. Code :59933

Day and Date : Tuesday, 24- 4 - 2018 **Total Marks : 100**

Time : 10.00 a.m. to 1.00 p.m.

Instructions :
1) **All questions are compulsory.**
2) **Figures to the right indicates full marks.**
3) **Use of non-programmable calculator is allowed.**
4) **Assume suitable data if necessary.**

SECTION - I

Q1) Attempt any Three.

a) Solve $(2xy + y - \tan y)dx + (x^2 - x\tan^2 y + \sec^2 y)dy = 0$ **[5]**

b) Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$ **[5]**

c) Solve $x\log x\dfrac{dy}{dx} + y = \log x^2$ **[5]**

d) Solve $\dfrac{dy}{dx} = y\tan x - y^2\sec x$ **[5]**

Q2) Attempt any Three.

a) A resistance of 100 ohms, an inductance 0.5 henries are connected in series with a battery of 20 volts. Find the current in the circuit at t = 0.5 sec, if i = 0 at t = 0. **[5]**

b) Find the orthogonal trajectory of the family of parabolas $y^2 = 4ax$ **[5]**

c) A body originally at 80°C cools down to 60°C in 20 minutes, the temperature of the air being 40°C. Find **[5]**
   i) when the temperature will be 50°C and
   ii) temperature of a body after half hour.

d) If 30% of radioctive substance disappeared in 10 days. How long will it take for 90% of it to disappear? **[5]**

P.T.O.

Q3) Attempt any four.

a) Using Taylor's series method find the value of y at x = 0.1 and x = 0.2 from $\frac{dy}{dx} = x^2 y - 1; y(0) = 1$ [5]

b) Solve by Euler's method $\frac{dy}{dx} = \frac{y-x}{y+x}; y(0) = 1$ at $x = 0.1$ with h = 0.02. [5]

c) Solve the following by Euler's modified method $\frac{dy}{dx} = \log_{10}(x+y)$ with $y(0) = 2$ at x = 0.2 with $h = 0.2$ [5]

d) Use Runge - Kutta method of fourth order to find y(0. 1), given that $\frac{dy}{dx} = 3e^x + 2y$, $y(0) = 0$ and h = 0.1 [5]

e) Solve the differential equations $\frac{dy}{dx} = 2y + z$ and $\frac{dz}{dx} = y - 3z$ for $x = 0.1$ using fourth order Runge - Kutta method. Given that y(0) = 1, z(0) = 0.5. Take $h = 0.1$ [5]

SECTION - II

Q4) Attempt any three of the following.

a) Evaluate the integral $\int_0^\infty x^7 e^{-2x^2} dx$ [5]

b) Prove that $\int_0^{\pi/2} \tan^p \theta d\theta = \frac{\pi}{2} \sec \frac{p\pi}{2}$ [5]

c) Evaluate $\int_0^\infty \frac{1-\cos mx}{x} e^{-x} dx$, where m being a parameter. [5]

d) Prove that $\frac{d}{dx} erf\left(ax^n\right) = \frac{2an}{\sqrt{\pi}} x^{n-1} e^{-a^2 x^{2n}}$ [5]

Q5) Attempt any three of the following.

a) Trace the curve $xy^2 = a^2(a - x)$ [5]

b) Trace the curve $r = a\cos 2\theta$ [5]

c) Find the length of arc of curve $r = a(1 - \cos\theta)$ which lies outside the curve $r = a\cos\theta$ [5]

d) Trace the curve $x^3 + y^3 = 3axy$ [5]

Q6) Attempt any four of the following.

a) Evaluate $\iint_A \frac{xy}{\sqrt{1-y^2}} dxdy$ wehre A is the area in the positive quadrant of the circle $x^2 + y^2 = 1$. [5]

b) Find by double integration the area inside the circle $r = a\sin\theta$ and outside the cardioid $r = a(1 + \cos\theta)$ [5]

c) Change the order of integration and hence evaluate $\int_0^2 \int_{2-\sqrt{4-y^2}}^{2+\sqrt{4-y^2}} dxdy$ [5]

d) Change into polar co-ordinates and hence evaluate $\int_0^a \int_y^a \frac{x^2 dxdy}{\left(x^2+y^2\right)^{3/2}}$ [5]

e) Find the x - coordinate of the centre of gravity of the area bounded by the parabola $y^2 = 4x$ and $2x - y - 4 = 0$. [5]

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