Seat No.	

F.E. (Semester - II) Examination, November - 2018

ENGINEERING MATHEMATICS - II (New)

Sub. Code : 59933

Day and Date : Wednesday, 28 - 11 - 2018 **Total Marks : 100**

Time : 02.30 p.m. to 05.30 p.m.

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

SECTION - I

Q1) Attempt ANY THREE :

a) Solve $ye^{xy}dx + (xe^{xy} + 2y)dy = 0$. [5]

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

c) Solve $e^{-y}\sec^2 y dy = dx + xdy$. [5]

d) Solve $y(2xy + e^x)dx = e^x dy$. [5]

Q2) Attempt any three.

a) Find the orthogonal trajectory of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2 + \lambda} = 1, \lambda$ being parameter. [5]

b) Solve the equation $L\frac{di}{dt} + Ri = E_0 \sin \omega t$, where L, R and E_0 are constants and discuss the case when t increase indefinitely. [5]

c) The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What was the value of N after $1\frac{1}{2}$ hours? [5]

d) If a water at temperature 100°C cools to 80°C in 10 minutes, in a room maintained at a temperature of 30°C. Find when the temperature of water will become 40°C. [5]

Q3) Attempt any four.

a) Use Taylor's series method to find the value of y at $x = 0.1$, given that $\frac{dy}{dx} = xy + y^2$ with $x_0 = 0, y_0 = 1$. [5]

b) Using Euler's method find the value y at $x = 0.1$ from $\frac{dy}{dx} = x + y + xy; y(0) = 1$ taking step size $h = 0.02$ [5]

c) Determine the value of y by Euler's modified method when $x = 0.1$ in one step, given that $\frac{dy}{dx} = x^2 + y^2, y(0) = 1$. [5]

d) Use Runge-Kutta method of order four to find y at $x = 0.2$, given that $\frac{dy}{dx} = \frac{y-x}{y+x}; y(0) = 1$. Take $h = 0.2$. [5]

e) Apply Runge-Kutta method of order four to find approximate value of y and z at $x = 0.1$ for the equations $\frac{dy}{dx} = yz + x; \frac{dz}{dx} = xz + y$. Given that $y(0) = 1, z(0) = -1$. Take $h = 0.1$. [5]

SECTION - II

Q4) Attempt any three of the following :

a) Evaluate $\int_0^{\pi} \sin^2\theta(1+\cos\theta)^4 d\theta$. [5]

b) Evaluate $\int_0^{\infty} x^2 e^{-x^2} dx$. [5]

c) Verify the differentiation under integral sign rule for the integral $\int_a^{a^2} \frac{1}{x+a} dx$, where a is parameter. [5]

d) Evaluate $\int_0^1 x^{m-1}(1-x^2)^{n-1} dx$ [5]

Q5) Attempt any three of the following :

a) Trace the curve $r = 3 + 2\cos\theta$. [5]

b) Trace the curve $y^2 = \frac{x^3}{4-x}$. [5]

c) Trace the curve $r = a\sin\theta$. [5]

d) Find the length of the curve $\theta = \frac{1}{2}\left(r + \frac{1}{r}\right)$ from $r = 1$ to $r = 2$. [5]

Q6) Attempt any four of the following :

a) Evaluate $\int_0^1 \int_0^{1-x} (x+y)\,dx\,dy$. [5]

b) Changing the order of integration evaluate $\int_0^2 \int_0^{x^2/4} xy\,dx\,dy$. [5]

c) Evaluate $\int_0^{a/2} \int_y^{\sqrt{a^2-y^2}} \log(x^2+y^2)\,dx\,dy$. [5]

d) Find the moment of inertia of the area included between $y^2 = 4ax$ and $x^2 = 4ay$ about the X-axis. [5]

e) Find the mass of an ellipse plate $\frac{x^2}{4} + \frac{y^2}{9} = 1$ if the density at any point P(x,y) on it is kxy. [5]

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