P-301

Total No. of Pages : 4

Seat No.	

F.E. (Part-II) (Semester-II) (New) Examination, April - 2016
ENGINEERING MATHEMATICS-II
Sub. Code: 59933

Day and Date : Saturday, 16- 04 - 2016 **Total Marks : 100**

Time : 10.30 a.m. to 1.30 p.m.

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

SECTION-I

Q1) Attempt Any Three of the following:

a) Solve $\frac{dy}{dx}+\frac{y\cos x+\sin y+y}{\sin x+x\cos y+x}=0$. **[5]**

b) Solve $2ydx+(2x\log x-xy)dy=0$. **[5]**

c) Solve $\frac{dy}{dx}=\frac{1}{xy+x^2y^3}$. **[5]**

d) Solve $(y+xy^2)dx+(x-x^2y)dy=0$. **[5]**

Q2) Attempt Any Three of the following:

a) The charge q on the plate of a condenser C charged through a resistance R by a steady voltage V satisfies the differential equation $R\frac{dq}{dt}+\frac{q}{c}=V$. If $q=0$ and $t=0$ show that $i=\frac{V}{R}e^{-t/RC}$. **[5]**

P.T.O.

b) Find the orthogonal trajectories of the family of confocal and coaxial parabolas $r = \frac{2a}{1+\cos\theta}$. [5]

c) Water at temperature 100°C cools in 10 min to 80°C in a room temperature 25°C. [5]

Find:

i) The time when temperature is 40°C and

ii) The temperature of water after 20 minutes.

d) The rate at which bacteria multiply is proportional to the instantaneous number present. If the original number doubles in two hours, in how many hours will it triple? [5]

Q3) Attempt Any Four of the following:

a) Obtain series solution upto x^4 using Taylors series method for $\frac{dy}{dx} = e^x - y^2$ with $y(0) = 1$. [5]

b) Using Euler's method find the approximate value of y when $x = 1.5$ in five steps, given $\frac{dy}{dx} = y^2 - \frac{y}{x}$ and $y(1) = 1$. [5]

c) Determine the value of y when $x = 0.2$ given that $\frac{dy}{dx} = y + e^x$, $y(0) = 0$ by Euler's modified method. [5]

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

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

SECTION-II

Q4) Attempt Any Three of the following:

a) Evaluate the integral $\int_0^\infty x^3 e^{-\sqrt{x}} dx$. [5]

b) Evaluate $\int_5^6 (x-5)^5 (6-x)^6 dx$. [5]

c) Prove that $\int_0^\infty e^{-x^2} \cos ax dx = \frac{\sqrt{\pi}}{2} e^{-a^2/4}$, where a is parameter. [5]

d) Find expression of erf(x) in terms of series. [5]

Q5) Attempt Any Three of the following:

a) Trace the curve $y(x^2 + 4a^2) = 8a^3$. [5]

b) Trace the curve $r = a(1 + \sin\theta)$. [5]

c) Find the length of arc of $y^2 = 4x$ cut off by the line $3y = 8x$. [5]

d) Trace the curve $\frac{2a}{r} = 1 + \cos\theta$. [5]

Q6) Attempt Any Four of the following:

a) Evaluate $\int_0^1 \int_{y^2}^{y} (1+xy^2)\,dx\,dy$. **[5]**

b) Find the mass of a lamina in the form of the cardioid $r = a(1+\cos\theta)$, where density at any point varies as the square of its distance from the initial line. **[5]**

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

d) Find the moment of intertia of about the X=axis of the area enclosed by lines $x=0,\ y=0, \frac{x}{a}+\frac{y}{b}=1$. **[5]**

e) Evaluate $\int_0^{\pi/2} \int_0^{a\cos\theta} r\sqrt{a^2-r^2}\,dr\,d\theta$. **[5]**

●●●●●