1E2002

Roll No.

Total No of Pages: [3]

1E2002

B. Tech I Sem. (Main/Back) Exam. Jan. 2016
102 Engineering Mathematics-I
Common to all Branches

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. NIL

2. NIL

UNIT-I

Q.1 (a) Find the asymptotes of the curve

$x^3 - 5x^2y + 8xy^2 - 4y^3 + 2y^2 + x^2 - 3xy - 1 = 0.$ [8]

(b) Show that the radius of curvature at any point P on the parabola $y^2 = 4ax$, is

$\frac{2(SP)^{3/2}}{\sqrt{a}}$; where S is the focus of the parabola. [8]

OR

Q.1 (a) Prove that the curve $x^3 + y^3 = a^3$ has point of inflexion at the point of inflexion at the points where it crosses the co-ordinate axes. [8]

(b) Trace the curve $r=a(1+\cos\theta)$. (Cardioid). [8]

UNIT-II

Q.2 (a) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$, then show that

$$x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} + y^2\partial^2 u/\partial y^2 = \sin 2u\,(1-4\sin^2 u)$$ [8]

(b) If measurements of radius of base and height of a right circular cone are incorrect by -1% & 2% respectively, find the error in its volume. [8]

OR

Q.2 (a) Find the minimum value of $x^2+y^2+z^2$, given that $ax + by + cz = p$ [8]

(b) Find the volume of the greatest rectangular parallelopiped inscribed in the ellipsoid whose equation is $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$ [8]

UNIT-III

Q.3 (a) Find the surface area of the solid formed by revolving the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, about the major axis. [8]

(b) Find the volume of the solid generated by revolving the curve $(a-x)\,y^2 = a^2x$, about its asymptote. [8]

OR

Q.3 (a) Change the order of integration in the integral $\int_0^a \int_{\left\{a-\sqrt{a^2-y^2}\right\}}^{\left\{a+\sqrt{a^2-y^2}\right\}} xy\,dx\,dy$ and then evaluate it. [8]

(b) Show that $\int_0^\infty \frac{x^2dx}{(1+x^4)^3} = \frac{5\pi\sqrt{2}}{128}$. [8]

UNIT-IV

Q.4 (a) Solve:-

(i) $(1+y^2)+\left(x-e^{-\tan^{-1}y}\right)\frac{dy}{dx}=0.$ [5]

(ii) $x\frac{dy}{dx}+y=y^2\log x.$ [5]

(b) $(D^2+1)^2y=24x\cos x$; D = d/dx, Solve it. [6]

OR

Q.4 (a) Solve:

(i) $(3x^2y+y/x)\,dx+(x^3+\log x)\,dy=0$ [5]

(ii) $(xy\sin xy+\cos xy)\,ydx+(xy\sin xy-\cos xy)\,xdy=0.$ [5]

(b) Solve:

$\frac{d^2x}{dt^2}+2n\cos\alpha\frac{dx}{dt}+n^2x=a\cos nt$, such that x = 0 and dx/dt = 0 at t = 0. [6]

UNIT-V

Q.5 (a) Solve:

$(1+x)^2\,d^2y/dx^2+(1+x)\,dy/dx+y=4\cos\{\log(1+x)\}.$ [8]

(b) Solve:

$\frac{d^2y}{dx^2}+(3\sin x-\cot x)\frac{dy}{dx}+(2\sin^2x)y=\sin^2x\,e^{-\cos x}$ [8]

OR

Q.5 (a) Solve:

$(2x^2+3x)\,d^2y/dx^2+(6x+3)\,dy/dx+2y=(x+1)e^x.$ [8]

(b) Solve by the method of variation of parameters-

$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}-y=x^2e^x.$ [8]

---

http://www.rtuonline.com
http://www.rtuonline.com