1E2002

Roll No. ___________ Total No of Pages: 3

1E2002
B.Tech I Sem. (Main/Back) Exam. Jan-Feb 2013
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.*

UNIT – I

Q.1. (a) Find the Asymptotes of the following curve:
$x^3+3x^2y-4y^3-x+y+3=0$ [8]

(b) For an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, $\rho=\frac{a^2b^2}{p^3}$ where "p" denotes the length of perpendicular from center of ellipse on the tangents at p. [8]

OR

(a) Show that the curve $ay^2=x(x-a)(x-b)$ has two and only two points of inflexion. [8]

(b) Trace the curve $r^2=a^2\cos 2\theta$. [8]

UNIT – II

Q.2. (a) If $u=\cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, show that $xu_x+yu_y,=\frac{-1}{2}\cot u$. [8]

(b) In a Plane triangle the angles and sides receive small variations, prove that

(a) $\delta a\cos c+\delta c\cos A=0, b, B$ being constant.

(b) $C\delta A + a\cos B\delta c = 0, a, b$ being constant. [8]

OR

(a) Find the Maxima and Minima of the function.

$f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$. [8]

(b) Find 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 length of the arc of the parabola $y^2 = 4ax$ cut off by its latus rectum. [8]

(b) Find the volume of the solid formed by revolving the plane area enclosed by the loop of the curve $y^2 = x^2(1-x^2)$ about x-axis [8]

OR

(a) Evaluate the integral $I = \int_0^\infty \int_0^\infty e^{-(x2+y2)} dxdy$ by changing to polar coordinates. [8]

(b) Evaluate

(a) $\int_0^\infty \frac{1}{1+x^4} dx$

(b) $\int_0^{\pi/6} \cos^4 3\theta \sin^2 6\theta . d\theta$ [8]

UNIT – IV

Q.4 (a) Solve $\sin y \frac{dy}{dx} = \cos y(1 - x\cos y)$ [5]

(b) Solve $(e^y + 1)\cos x \, dx \quad e^y \sin x \, dy = 0$ [5]

(c) Solve $(D^2 - 2D - 4)y = e^x \cos x - \sin^2 x$ [6]

OR

(a) Solve $y(2xy+e^x)dx-e^x dy=0$ [5]

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

(c) Solve $(D^2+3D+2)y=x^2\cos x$ [6]

UNIT – V

Q.5 (a) Solve $(x^2D^2-3xD+1)y=\frac{\log x.\sin\log x+1}{x}$

$D=\frac{d}{dx}$ [8]

(b) Solve $\sqrt{x}\frac{d^2y}{dx^2}+2x\frac{dy}{dx}+3y=x$ [8]

OR

(a) Solve $\cos x\frac{d^2y}{dx^2}+\sin x\frac{dy}{dx}-2y\cos^3 x=2\cos^5 x$ [8]

(b) Solve $(D^2+4)y=4\tan 2x$, by variation of parameters method [8]
