

1E2002

Roll No. _____

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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:

$$x^3 + 3x^2y - 4y^3 - x + y + 3 = 0 \quad [8]$$

(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.

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[71240]

(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.

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

(b) Find Volume of the greatest rectangular parallelepiped inscribed in the ellipsoid whose equation is

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1. \quad [8]$$

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 $I = \int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)} dx dy$ 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 $(e^x + 1) \cos x dx - e^x \sin x dy = 0$ [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 $(x^2D^2 - 3xD + 1)y = \frac{\log x \cdot \sin \log x + 1}{x}$

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

(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]