R07

Code No: Z0125

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year Examinations, December - 2017
MATHEMATICS-I
(Common to CE, EEE, ME, ECE, CSE, CHEM, EIE, IT, AE, BT)

Time: 3 hours **Max. Marks: 80**

Answer any five questions
All questions carry equal marks
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1.a) Solve $\frac{dy}{dx}+\frac{y}{x-1}=xy^{1/3}$.

b) Find the orthogonal trajectories of the family of curves $r^n=a^n.\cos n\theta$. [8+8]

2.a) Solve $\frac{d^3y}{dx^3}+y=\left(e^x+1\right)^2$.

b) Solve $(D^2+a^2)y=\tan x$. [8+8]

3.a) Calculate the approximate value of $\sqrt{10}$ to four decimal places using Taylor's theorem.

b) Find the dimensions of the rectangular box, open at the top of maximum capacity whose surface area is 108 sq.inches. [8+8]

4.a) Show that the radius of curvature at any point of the cardioid $r=a\left(1+\cos\theta\right)$ is $\frac{2}{3}\sqrt{2ar}$ and prove that $\frac{p^2}{r}$ is constant.

b) A straight line of given length slides with extremities on two fixed straight lines at right angles. Find the envelope of the circle drawn on the sliding line as diameter. [8+8]

5.a) The arc of the cardioid $r=a\left(1+\cos\theta\right)$ included between $\frac{-\pi}{2}\le\theta\le\frac{\pi}{2}$ is rotated about the line $\theta=\frac{\pi}{2}$. Find the area of surface generated.

b) Evaluate $\iiint z\left(x^2+y^2+z\right)dxdydz$ taken over the volume of the cylinder $x^2+y^2=a^2$ intercepted by the planes z = 0 and z = h. [8+8]

6.a) Determine the intervals in which the series $x-\frac{x^2}{4}+\frac{x^3}{9}-\frac{x^4}{16}+....$ is convergent.

b) Discuss the convergence of the infinite series $\frac{2}{3}x+\left(\frac{3}{4}\right)^2x^2+\left(\frac{4}{5}\right)^3x^3+.....$ [8+8]

7.a) A vector field is given by $\bar{F} = \left(x^2 - y^2 + x\right)\hat{i} - \left(2xy + y\right)\hat{j}$ show that $\bar{F}$ is irrotational and find its scalar potential.

b) Apply stokes theorem to evaluate $\int_c \left(x+y\right)dx + \left(2x-z\right)dy + \left(y+z\right)dz$ where c is the boundary of the triangle (2, 0, 0), (0, 3, 0) and (0, 0, 6). [8+8]

8.a) Find $L^{-1}\left\{\frac{s}{s^4 + 4a^4}\right\}$.

b) Solve by Laplace theorem $\frac{d^2y}{dx^2} + y = 6\cos 2t$ given that $y = 3, \frac{dy}{dx} = 1$ when t = 0. [8+8]

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