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First Semester B.E. Degree Examination, June / July 08

Engineering Mathematics

ime: 3 hrs. Max. Marks:100

Note : ***Answer any FIVE full questions, choosing at least one question from each part.***

PART - A

a. Find the angle between any two diagonals of a cube. **(07 Marks)**

b. Find the image of the point P(2, -1, 4) in the plane $3x - 3y + z = 6$.

c. Find the point of intersection of the lines. **(07 Marks)**

$\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$ and $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$. Also find the equation of the plane containing these lines **(06 Marks)**

a. Find the shortest distance and the equations of the line of shortest distance between the lines

$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$. **(07 Marks)**

b. Find the equation of the right circular cone whose vertex is at the origin and the axis is the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and the semi - vertical angle is 30^0. **(07 Marks)**

c. Find the equation of the right circular cylinder whose axis is the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{2}$ and the radius is 2 units. **(06 Marks)**

PART - B

a. Find the nth derivatives of $e^x \sin^2 x$ **(06 Marks)**

b. If $y = x \log \frac{x-1}{x+1}$, prove that $y_n = (-1)^n (n-2)! \left[\frac{x-n}{(x-1)^n} - \frac{x+n}{(x+1)^n} \right]$. **(07 Marks)**

c. Find the angle of intersection of the curves $r = \frac{a\theta}{1+\theta}$ and $r = \frac{a}{1+\theta^2}$ **(07 Marks)**

a. If $u = \tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$ **(06 Marks)**

b. If x = u(1-v) and y = uv find $J' = \frac{\partial(x,y)}{\partial(u,v)}$ and $J = \frac{\partial(u,v)}{\partial(x,y)}$. Verify that $JJ' = 1$. **(07 Marks)**

c. In estimating the cost of a pile of bricks measured as 2 m × 15 m × 1.2 m, the tape is stretched 1% beyond the standard length. If the count is 450 bricks per cubic meter and the bricks cost Rs. 1,100 per thousand, find the approximate error in the cost. **(07 Marks)**

PART - C

5 a. Evaluate $\int_0^2 \frac{x^4}{\sqrt{4-x^2}}dx$. (06 Mar

b. Establish reduction formula for $\int_0^{\frac{\pi}{2}} \sin^m x \cos^n x\, dx$ where m and n are positive intege

(07 Mark

c. Trace the curve $y^2(a-x)=x^3, a>0$ (07 Mark

6 a. Find the area bounded by a quadrant of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. (06 Mark

b. Find the area of the surface formed by revolution of $y^2 = 4$ ax about its axis, by the a from the vertex to one end of the latus rectum. (07 Mark

c. Find the volume of the solid formed by revolution of the cissoids $y^2(2a-x)=x^3$ about it asymptote. (07 Mark

PART - D

7 a. Solve : $(x+1)\frac{dy}{dx}-y=e^{2x}(x+1)^2$. (06 Marks

b. Solve : $(xy^3+y)dx+2(x^2y^2+x+y^4)dy=0$. (07 Marks

c. Solve : $ydy+\sin^2(x/y)[xdy-ydx]=0$. (07 Marks

8 a. Show that the family of conics $\frac{x^2}{a^2+\lambda}+\frac{y^2}{b^2+\lambda}=1$, where λ is a parameter, is sel orthogonal. (06 Marks)

b. State D'Alebert's ratio test. Use it to test the convergence of –

$\frac{3}{4+1}+\frac{3^2}{4^2+1}+\frac{3^3}{4^3+1}+-----$. (07 Marks)

c. Define absolute convergence and conditional convergence. Is the serie $1-\frac{1}{2\sqrt{2}}+\frac{1}{3\sqrt{3}}-\frac{1}{4\sqrt{4}}+------$ conditionally convergent? (07 Marks)

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