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Uni. Roll No: ....

II Mid- Term Examination, 2014-15

Course: B.Tech. I- Year, I-Semester

Subject: Mathematics -I (AHM- 101)

Time: 90 Minutes, **Max. Marks: 20**

Section –A

Note: Attempt all questions: **($5 \times 1 = 5$ Marks)**

Q1. If f (u, v) = u and g (u, v) = v^2 then find the value of $\frac{\partial(u,v)}{\partial(f,g)}$.

Q2. Write the necessary and sufficient conditions for f(x, y) to be maximum.

Q3. Find the radius of curvature if the pedal equation of an ellipse be $\frac{1}{p^2}=\frac{1}{a^2}+\frac{1}{b^2}-\frac{r^2}{a^2b^2}$.

Q4. Write the quadrants where curve $x^5 + y^5 = 5a^2x^2y$ is symmetric.

Q5. Find the envelope of the family of straight lines $y = mx + \frac{a}{m}$.

Section–B

Note: Attempt any three questions: **($3 \times 2 = 6$ Marks)**

Q1. Find the points (x, y) where the function $xy(1 - x - y)$ is either maximum or minimum.

Q2. If $x = uv$ and $y=\frac{u+v}{u-v}$ determine $\frac{\partial(u,v)}{\partial(x,y)}$.

Q3. Calculate the radius of curvature at (a, 0) for $a^2y^2 = a^3 - x^3$.

Q4. Find the envelope of straight lines $\frac{x}{a}+\frac{y}{b}=1$ where the parameters a and b are connected by the relation $ab = c^2$, where c being a constant.

Section–C

Note: Attempt any three questions: **($3 \times 3 = 9$ Marks)**

Q1.Find the dimensions of the rectangular box with open top of maximum capacity whose surface area is 432 sq. cm.

Q2. If $u^3 + v^3 + w^3 = x + y + z$, $u^2 + v^2 + w^2 = x^3 + y^3 + z^3$ and $u + v + w = x^2 + y^2 + z^2$ then find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$.

Q3. Trace the curve $y^2(2a - x) = x^3$.

Q4. Find the equation of the circle of curvature at the point (0, 1) of the curve $y = x^3 + 2x^2 + x + 1$.