22:26

Printed pages: 2 **University Roll No.......................**

FIRST Mid Term Examination, 2016 – 2017
B. Tech. I Year I Semester
AHM – 1101: Engineering Mathematics - I

Time: - 1 ½ Hrs. **Max. Marks:- 20**

SECTION A **(1 x 5 = 5 marks)**

Note : Attempt **ALL** questions.

Q.1. Calculate the Jacobian $J\left(\frac{u,v,w}{x,y,z}\right)$ of the following:

$u = x + 2y + z,\ v = x + 2y + 3z,\ w = 2x + 3y + 5z$

Q.2. If $w = (y-z)(z-x)(x-y)$ then find $\frac{\partial w}{\partial x}+\frac{\partial w}{\partial y}+\frac{\partial w}{\partial z}$

Q.3. Find the degree of the homogeneous function

$u(x, y, z) = \frac{xy+yz+zx}{x^2+y^2+z^2}$

Q.4. Find the asymptotes parallel to x – axis for the curve

$x^2y^2 = a^2(x^2+y^2)$; a is a constant.

Q.5. Given curve is :

$$(a+x)y^2 = x^2(3a-x)$$

(i) About which of the coordinate axes, the above curve is symmetrical?
(ii) What are its tangents at the origin?

SECTION B **(2 x 3 = 6 marks)**

Note : Attempt any **THREE** questions.

Q.1. If $u = e^{xyz}$, prove that $\frac{\partial^3 u}{\partial x \partial y \partial z} = (1+3xyz+x^2y^2z^2)u$

Q.2. If $u=\frac{yz}{x}, v=\frac{zx}{y}, w=\frac{xy}{z}$ then show that $J\left(\frac{u,v,w}{x,y,z}\right) = 4$

Q.3. If $V = \frac{x^4y^4}{x^4+y^4}$ then using Euler's theorem, prove that:

$x\frac{\partial V}{\partial x}+y\frac{\partial V}{\partial y} = 4V.$

Q.4. Expand $F(x, y) = e^x \cos y$ at $(1, \frac{\pi}{4})$.

SECTION C **(3 x 3 = 9 marks)**

Note : Attempt any **THREE** questions.

Q.1. If $u = \log\left[\frac{x^5+y^5}{x^2+y^2}\right]$ then using Euler's theorem, find $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$

Q.2. If $u=\frac{x+y}{1-xy}, v=\tan^{-1}x+\tan^{-1}y$ then find $J\left(\frac{u,v}{x,y}\right)$. Are u and v, functionally related? If yes, find the relationship between them.

Q.3. If $u = f(y-z, z-x, x-y)$, prove that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z} = 0.$

Q.4. A wire of length b is cut into two parts which are bent in the form of a square and a circle respectively. Find the least value of the sum of the areas so found using Lagrange's method of multipliers.