GLA University, Mathura **Set- B**

Mid- Term I Examination, 2012-13

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

Subject: - Mathematics –I (AHM-101) **Uni. Roll No:-**

Time:-1HOUR 30 Minutes **Total Marks:-20**

Notes:-

1) Attempt **ALL** questions of Section- A, **ANY TWO** from Section- B ,and **ANY TWO** from Section- C.
2) All parts of a question (a, b, etc.) should be answered at one place.
3) Answer should be brief and to-the-point and be supplemented with neat sketches.
4) Any missing or wrong data may be assumed suitably giving proper justification.
5) Figures on the right-hand side margin indicate full marks.

Section:-A (8 × .5 = 4)

Q.1 n^{th} derivative of 4^x is

* None of these * 4^x * $4^x \log 4$ * $4^x (\log 4)^n$

Q.2 If $y = x e^x$ then y_n at $x = 0$ is

* 1 * n * $n e^x$ * 0

Q.3 If $u = (x^2 + y^2)^{\frac{1}{3}}$ the value of $x^2 u_{xx} + 2xy u_{xy} + y^2 u_{yy}$ is

* $-\frac{4}{9}u$ * $\frac{2}{3}u$ * $-\frac{2}{9}u$ * $-\frac{2}{9}$

Q.4 For an implicit function $f(x, y) = c$, $\frac{dy}{dx}$ is equal to

* 0 * $-\frac{f_y}{f_x}$ * $-\frac{f_x}{f_y}$ * $\frac{f_y}{f_x}$

Q.5 If J_1 is Jacobian of u , v with respect to x , y and J_2 is Jacobian of x ,y with respect to u , v then

* $J_1 = J_2$ * $J_1 J_2 = -1$ * $J_1 J_2 = 1$ * $J_1 J_2 = 0$

.6 If u , v , w are functions of x , y , z then necessary condition for existence of functional relation between u , v , w is

* $J(u, v, w) \neq 1$ * $J(u, v, w) = 0$ * $J(u, v, w) \neq 0$ * $J(u, v, w) = 1$

Q.7 The sufficient conditions for function $f(x, y) = 0$ attains a relative maximum at (a, b) is

* None of these * $rt - s^2 > 0, r < 0$ * $rt - s^2 > 0, r > 0$ * $rt - s^2 < 0, r < 0$

Q 8. A point where function is neither maximum nor minimum is called

* Critical points * Shaddle point * Ordinary point * Simple point

Section:-B

Attempt any two of the followings . (2 × 3 = 6)

Q1. A rectangular box open at the top is to have a given capacity, Find the dimensions of the box requiring least material for its construction .

Q.2 If $u = \log\left(\frac{x^5 + y^5 + z^5}{x^2 + y^2 + z^2}\right)$ Prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 3$

Q.3 If $y_1 = \frac{x_2 x_3}{x_1}$, $y_2 = \frac{x_1 x_3}{x_2}$, $y_3 = \frac{x_2 x_1}{x_3}$ then prove that $\frac{\partial(y_1, y_2, y_3)}{\partial(x_1, x_2, x_3)} = 4$

Section.- C

Attempt any two of the followings . (2 × 5 = 10)

Q1. If $\frac{x^2}{a^2 + u} + \frac{y^2}{b^2 + u} + \frac{z^2}{c^2 + u} = 1$ Prove that

$$\left(\frac{\partial u}{\partial x}\right)^2 + \left(\frac{\partial u}{\partial y}\right)^2 + \left(\frac{\partial u}{\partial z}\right)^2 = 2\left(x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z}\right)$$

Q .2 If $y = \left[x + \sqrt{x^2 + 1}\right]^m$ Prove that $(x^2 + 1)\, y_{n+2} + (2n+1)\, x\, y_{n+1} + (n^2 - m^2)\, y_n = 0$.

Also find $y_n(0)$.

.Q .3 If u , v, w are the roots of the cubic equation $(x - a)^3 + (x - b)^3 + (x - c)^3 = 0$ in x, then find $\partial(u, v, w) / \partial(a, b, c)$.

SET-D

Roll No.....