

**Bago University**

**Department of Mathematics**

**Second Semester Examination, September 2019**

**First Year ( B.Sc )**

**Math- 1104**

**(Mathematics Specialization)**

**Differential and Integral Calculus**

**Answer All Questions.**

**Time Allowed: (3) Hours**

**1.(a)** Find the absolute maximum and absolute minimum values of function

$$h(x) = \sqrt[3]{x} \text{ on the given interval } -1 \leq x \leq 8.$$

**(b)** Find the value or values of  $c$  that satisfy the Mean Value Theorem for the

$$\text{function } f(x) = x + \frac{1}{x} \text{ is in the interval } \left[ \frac{1}{2}, 2 \right].$$

**2.(a)** If  $f(x, y) = 2x + e^{x^2+y}$ , then find  $\frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, \frac{\partial^2 f}{\partial x^2}, \frac{\partial^2 f}{\partial y^2}, \frac{\partial^2 f}{\partial x \partial y}, \frac{\partial^2 f}{\partial y \partial x}$ .

**(b)** Let  $u = x^2 + y^2$ ,  $x = r \cos \theta$ ,  $y = r \sin \theta$ . Find  $\frac{\partial u}{\partial r}$  and  $\frac{\partial u}{\partial \theta}$  using the chain rule

and give the answer in terms of  $r, \theta$ .

**3.(a)** Evaluate the following indefinite integrals by using substitution method

$$(i) \int \frac{2z}{\sqrt[3]{z^2+1}} dz, (ii) \int \csc^2 2\theta \cot 2\theta d\theta.$$

**(b)** Evaluate the following indefinite integral by using substitution method

$$(i) \int \frac{\sin(2t+1)}{\cos^2(2t+1)} dt; (ii) \int \frac{9r^2}{\sqrt{1-r^3}} dr.$$

**4.(a)** Find the length of the graph  $f(x) = \frac{x^3}{12} + \frac{1}{x}, 1 \leq x \leq 4$ .

**(b)** Find the area of the surface generated by revolving the curve  $y = 2\sqrt{x}$ ,

$1 \leq x \leq 2$  about the  $x$ -axis.

**P.T.O.**

5.(a) Evaluate (i)  $\int \sin^3 x \cos^2 x dx$ , (ii)  $\int \frac{1}{\sqrt{4+x^2}} dx$  by using trigonometric substitution.

(b) Find the volume of the solid generated by revolving the region bounded by  $y = \sqrt{x}$  and the line  $y = 1$ ,  $x = 4$  about the line  $y = 1$ .

6.(a) Solve the equation  $x \frac{dy}{dx} = x^2 + 3y$ ,  $x > 0$ .

(b) Find the particular solution of  $3xy' - y = \ln x + 1$ ,  $x > 0$ , satisfying  $y(1) = -2$ .

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