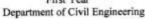
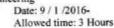
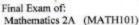


#### Fayoum University Faculty of Engineering









# Answer the following questions:

## Question (1) (16-points)

- (a) Show that the function  $f(x, y) = 2x^4 + e^{4y} 4x^2e^y$  has exactly two critical points, both of which are local minima.
- (b) Find the maximum and minimum of the function  $f(x, y, z) = 4x^2 + y^2 + z^2$  subject to  $x^4 + y^4 + z^4 = 1$

### Question (2) (18-points)

- (a) Evaluate the following integral  $\int_{0}^{1} \int_{y}^{1} \frac{3}{4+x^3} dxdy$
- (b) Find the centre of mass of the lamina bounded by  $y = x^2 4$ , y = 5 if the density is the square of the distance from the y axis.
- (c) Find the area using line integral of the region bounded by  $x^{2/3} + y^{2/3} = 1$ (Hint: use  $x = \cos^3 t$ ,  $y = \sin^3 t$ )

### Question(3) (18-points)

- (a) Find the volume of the solid below  $z = \sqrt{x^2 + y^2}$  and above z = 0 and inside  $x^2 + (y 1)^2 = 1$
- (b) Compute  $\iiint_R \frac{1}{z} dV$ , where R is the closed region bounded by  $z = e^{xy}$ , z = 1, y = x + 1, y = 0, x = 0.

#### Question(4) (18-points)

- (a) Compute the line integral  $\int_C (2xe^{x^2} 2y)dx + (2y 2x)dy$ , where C runs from (1,2) to (-1,1)
- (b) Evaluate the work done by the force  $\mathbf{F}(\mathbf{x}, \mathbf{y}) = (4xy 2x)\mathbf{i} + (2x^2 x)\mathbf{j}$ , acting on an object as it moves along the parabola  $y = x^2$  from (-2,4) to (2,4).
- (c) Compute the surface area of the portion of the plane  $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ , a, b, c > 0, that is in the first octant.

With My Best Wishes Prof. Dr. Mohamed Eissa Sayed-Ahmed

