Kingdom of Saudi Arabia
Ministry of Higher Education
Al-Jouf University
The College of Engineering Science

First Semester 1437/1436
Final Examination

Time:2:00Hr
Paper Code: Math-201 **Sub: Calculus-3** **MM-60**

Attempt all questions and each question carry equal marks 15.

Question One (4+4+7=15 marks)

(a) Evaluate the double integral $\iint_R y^2x\,dA$ over the rectangle
$$R = \{(x,y): -3 \le x \le 2,\ 0 \le y \le 1\}.$$

(b) Find the volume of the solid bounded by the plane $z = 0$ and the parabolid $z = 1 - x^2 - y^2$.

(c) Evaluate $\iint_R (x + 2y)dA$, where R is the region bounded by the parabolas $y = 2x^2$ and $y = 1 + x^2$.

Question Two (4+4+7=15 marks)

(a) Evaluate the triple integral $\iiint_B xyz^2\,dV$, where B is the rectangular box given by $B = \{(x,y,z): 0 \le x \le 1,\ -1 \le y \le 2,\ 0 \le z \le 3\}$.

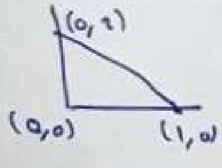
(b) (i) The point $(2, \frac{\pi}{4}, \frac{\pi}{3})$ is given in spherical coordinates. Plot the point and find its rectangular coordinates.

(ii) The point $(0, 2\sqrt{3}, -2)$ is given in rectangular coordinates. Find spherical coordinates for this point.

(c) Use a triple integral to find the volume of the solid within the cylinder $x^2 + y^2 = 9$ and between the planes $z = 1$ and $x + z = 5$.

Question Three (4+4+7=15 marks)

(a) Find the mass of rectangular lamina with vertices $(0,0)$, $(1,0)$ and $(0,2)$ if the density function $\rho(x,y) = 1 + 3x + y$.



(b) Find the ***divergence*** and the ***curl*** of the vector field
$$F(x,y,z) = xzi + xyzj - y^2k.$$

(c) Use spherical coordinates to find the volume of the solid G bounded above by the sphere $x^2 + y^2 + z^2 = 16$ and below the cone $z = \sqrt{x^2 + y^2}$.

m =

$y - y_1 = m($

Question Four (4+4+7=15 marks)

(a) Evaluate $\int_c 3xy\,dy$ using the parameterization.
$$x = t,\ y = 2t\ \ (0 \le t \le 1).$$

(b) Evaluate $\int_c (3x^2 + y^2)dx + 2xy\,dy$ along the circular arc c given by
$$x = cost,\ y = sint\ \ \left(0 \le t \le \frac{\pi}{2}\right).$$

(c) Evaluate the line integral $\int_c (\frac{1}{2}xy + \frac{1}{2}z^3)ds$ from $(1,0,0)$ to $(-1,0,\frac{\pi}{2})$ along the helix c that is represented by the parametric equations.
$$x = cost,\ y = sint,\ z = t\ \ \left(0 \le t \le \frac{\pi}{2}\right).$$