King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
Math 302 Final Exam
The Third Semester of 2012-2013 (123)
Time Allowed: 180 Minutes

Name: _____ ID#: _____

Instructor: _____ Sec #: _____ Serial #: _____

- Mobiles and calculators are not allowed in this exam.
- Write all steps clear.

Question #	Marks	Maximum Marks
1		12
2		12
3		12
4		16
5		16
6		12
7		15
8		15
9		15
10		15
Total		140

Q:1(12 points) Let $A = \begin{bmatrix} 4 & 0 & 1 \\ 0 & 6 & 0 \\ -4 & 0 & 4 \end{bmatrix}$. Find all eigenvalues and eigenfunctions.

Q:2 (12 points) Use Green's theorem to evaluate the line integral

$\oint_C (2x^2 \sin 2x - 3y^2)dx + (2x^2 + 3y^2 e^{y^3})dy,$

where C is the boundary of the region bounded by $y = x^2$ and $y = x^3$ in the first quadrant.

Q:3(12 points) Find surface area of that portion of the sphere $x^2 + y^2 + z^2 = 9$ that is above the $z = 0$ plane and within the cylinder $x^2 + y^2 = 4$.

Q:4 (10+6 points) (A) Find real numbers a, b, c, and d such that

$f(z) = x^2 + axy + by^2 + i(cx^2 + dxy + y^2)$ is analytic.

(B) Show that the function $f(z) = \dfrac{x + iy}{x^2 + y^2}$ is not analytic.

Q:5 (8+8 points) (A) Find all solutions of $\sinh z + 1 = 0$.

(B) Express $\mathrm{Ln}(1+\sqrt{3})^5$ as $a + ib$.

Q:6 (12 points) Evaluate the integral $\int_C Re(z)\ dz$ where C is the upper half of the ellipse $x^2 + 9y^2 = 36$ from $z = 6i$ to $z = -6i$.

Q:7 (15 points) Evaluate the integral $\oint_C \dfrac{-3z+2}{z^2-8z+12}\,dz$ where C is the circle $|z|=9$.

Q:8 (15 points) Evaluate the integral $\oint_C \dfrac{\sin z}{(z-\pi)^4} + \dfrac{\cos z}{(2z-\pi)^4}\, dz$ where C is the circle $|z| = 3$.

Q:9 (15 points) Expand $f(z) = \dfrac{1+z}{1-z}$ in a Taylor series centered at $z = i$.

Q:10 (15 points) Expand $f(z) = \dfrac{1}{(z-1)^2(z-3)}$ in a Laurent series valid for $0 < |z-1| < 2$.