Final Version

King Fahd University of Petroleum & Minerals
Department of Mathematics & Statistics
Math 302 Final Exam
The Third Semester of 2013-2014 (133)
Time Allowed: 150 Minutes

Name: _____ ID#: _____

Section/Instructor: _____ Serial #: _____

- Mobiles and calculators are not allowed in this exam.
- Write neatly and eligibly. You may lose points for messy work.
- Show all your work. No points for answers without justification.

Question #	Marks	Maximum Marks
1		15
2		15
3		20
4		15
5		15
6		15
7		15
8		15
9		15
Total		140

Q:1 (15 points) Determine whether the set S of vectors of the form $(x, x+y, 2y, 0)$ (where $x,\ y$ are real numbers) is a subspace of R^4. If yes, what is its dimension ? find a basis for S. Is the basis unique? if no, find a second basis.

Q:2 (15 points)Find the rank of the matrix $A = \begin{pmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{pmatrix}$

Q:3 a (8 points) Find the values of $(1-i)^{2i}$.

Q:3 b (12 points) Solve $cosz = -3$.

Q:4 (15 points) Show that $u(x, y) = \cos x \cosh y$ is a harmonic function and determine $v(x, y)$ so that $w = u + iv$ is an analytic function.

Q:5 (15 points)Find all Laurent's series expansion of the function f around $z = 0$ and specify in which annuli they converge; f being defined by

$$f(z) = \frac{1}{z^2(z-1)}$$

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Q:6 (15 points) Show that $z = 0$ is removable singularity of $f(z) = \frac{sin4z-4z}{z^2}$.

Q:7 (15 points) Evaluate

$$\oint_{|z-1|=3} \frac{e^{2z}}{(z-2)^2} dz$$

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Q:8 (15 points) Evaluate

$$\oint_{|z|=3} \frac{e^z}{(z-1)(z-2)} dz$$

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Q:9 (15 points) Evaluate the Cauchy principal value of

$$\int_{-\infty}^{\infty} \frac{1}{(x^2+1)^3} dx.$$