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American International University-Bangladesh

Faculty of Science & Information Technology

Department of Mathematics

MAT2101: Complex Variable, Laplace and Z-transformations (Sections: All)

Midterm Examination Summer: 2015-2016

Total Marks: 40 Time: 2 hours

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**Instruction: Answer all the questions with the given conditions.**

1.Answers **ALL** of the following:

(a) Evaluate

(b) Evaluate .

(c) Evaluate .

(d) Evaluate

(e) Evaluate

(f) Evaluate

(g) Express in the form of

(h) Find the polar form of the complex number

(i) Find the rectangular form of the complex number

(j) Write Cauchy-Riemann (**C-R**) equations in polar form.

2. Answer any **ONE** of the following:

(a) Let, is a periodic function of period 3. Then

(i) sketch and(ii) find the Laplace transformation of .

(b) Find using **convolution theorem**.

3. Answer any **ONE** of the following:

(a) Sketch and express it in terms of unit step function.

Also find it’s Laplace transformation where .

(b) Find and sketch , where .

4. Solve any **TWO** of thefollowing differential equations using Laplace transform:

(a) where .

(b) where .

(c)

where , , and .

5. Answer any **ONE** of the followings:

(a) Find the roots of the equation  and locate the roots in the complex plane.

(b) Describe and sketch the locus represented by each of the followings:

(i)  (ii) .

6. Answer any **ONE** of the followings:

(a) Verify Cauchy-Riemann (C-R) equations for the function . If possible

then find 

(b) Let the rectangular region in *z*-plane which is bounded by the lines

Determine the region of the *w*-plane into which

is mapped under the transformation .