

**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**Plot 91, Cadastral Zone, NnamdiAzikiwe Expressway, Jabi, Abuja.**

**FACULTY OF SCIENCES**

**January\February Examination 2018**

**Course Code: MTH381**

**Course Title: Mathematical Methods III**

**Credit Unit: 3**

**Time Allowed: 3 HOURS**

**Instruction: ATTEMPTNUMBER ONE (1) AND ANY OTHERFOUR (4) QUESTIONS**

1. (a) ; *find f(1,-3)* **[5 Marks]**

(b) If****

Find the Jacobian **[5 Marks]**

(c) Evaluate the Laplace transform of **[6 Marks]**

Evaluate the double integral  **[6 Marks]**

**2. (a)** Evaluate  **[6 Marks]**

. (b) Determine the Fourier Series to represent the function:

; **[6 Marks]**

3. *(a) Given that* , show that  is an harmonic function and then find the function that is conjugate to .

(Hint: find  that ensures that  is analytic). **[6 Marks]**

(b) State and prove Liouville’s theorem. **[6 Marks]**

4. (a) Evaluate , where R is the rectangular box

in space.**[4 Marks]**

(b) If and 

Find (i)  (ii)  (iii)  (iv)  (v) **[8 Marks]**

5. (a) (i) State the Green’s theorem **[2 Marks]**

(ii) Let  and let C be the circle 

oriented anticlockwise;

Find  by applying the Green’s theorem. **[6 Marks]**

(b) Evaluate  around the circle C in the clockwise sense, where 

**[6 Marks]**

6. (a) Let 

Evaluate  using the Divergence theorem, where D is the ball:

**[6 Marks]**

(b)Write the complex numberin the polar form; hence find *modz and arg z.*

**[6 Marks]**