

**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**UNIVERSITY VILLAGE, PLOT 91 CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESS WAY, JABI - ABUJA.**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCES**

**JANUARY/FEBRUARY 2018 EXAMINATION**

**COURSE CODE: PHY 312**

**COURSE TITLE: MATHEMATICAL METHODS OF PHYSICS II**

**TIME: 2 HOURS**

**INSTRUCTION: Answer One and any other Three (3)questions.**

**QUESTION ONE**

1ai) The displacement of a part of a machine is tabulated with the corresponding angular moment (in degrees) of the crack. Express as a fourier series up to the third harmonic.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 |
| F(x) | 2.34 | 3.01 | 3.69 | 4.15 | 3.69 | 2.20 | 0.83 | 0.51 | 0.88 | 1.09 | 1.19 | 1.64 |

11 marks

1bi) Verify that satisfy the Legendre differential equation.14marks

**QUESTION TWO**

2a) From the prescription with or whichever is an integer, obtain the first four Legendre polynomials. 6marks

2b) Using the above prescription, show that is a generating function for the . Show that . 9 marks

**QUESTION THREE**

3a) Using recurrence relation for J show that

* + 1. ,
    2. 15 marks

**QUESTION FOUR**

4a) If show that 7marks

4b) If find 8 marks

**QUESTION FIVE**

5a) Prove the relation for the Legendre polynomials.

7marks

5b) Using this relation, obtain the polynomials. P4, P5 and P6. 8 marks