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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**University Village, Nnamdi Azikiwe Expressway, Plot 91, Cadastral Zone, Jabi, Abuja**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCES**

**JANUARY/FEBRUARY 2018 EXAMINATION**

**COURSE CODE: PHY361**

**COURSE TITLE: GEOPHYSICS II**

**COURSE UNIT: 2 units**

**TIME: 2 hours**

**INSTRUCTION: Answer any 4 (FOUR Questions) only**

***QUESTION 1***

In a seismogram recorded at a regional distance, the S-P time lag is 5.5 s, and the focus is at a depth x/2, where x is the epicentral distance. The model Earth has a single layer of Poisson ratio 0.25 and constant S-wave velocity 1.5 km s-1. Calculate the depth of the focus. And the epicentral distance. (17 ½ Marks)

***QUESTION 2***

In a seismogram, the S-P time difference is equal to 5.31 s, and corresponds to a regional earthquake that occurred at a depth *h = 2H*, where H is the thickness of the crust. Given that the crust is formed by a layer of constant P-wave velocity of 3 km s-1, that below it there is a semi-infinite mantle of double that speed of propagation, and that Poisson’s ratio is 0.25, determine: (a) An expression for the travel-time of the P- and S-waves. (b) The epicentral distance for an emerging P-wave with a take-off angle of 30o at the focus. (17 ½ Marks)

***QUESTION 3***

A medium consists of a flat crust of thickness H and constant speed of propagation v1 on a semi-infinite mantle of constant speed of propagation v2. For a focus at the surface, at a distance *x* the direct wave arrives at a time t1 = x/a, the critical distance is *xc = 2a/√3* , and the direct and critical refracted waves intersect at the distance *x = 2a√3,* calculate the crust’s thickness, its speed of propagation, the mantle’s speed of propagation, and the critical angle. (17 ½ Marks)

QUESTION 4

A medium consists of a flat crust of thickness H and constant speed of propagation v1 on a semi-infinite mantle of constant speed of propagation v2 that dips downwards at 45o. For a focus at the surface, at a distance *x* the direct wave arrives at a time t1 = x/a, the critical distance is *xc = 2a/√3*, and the direct and critical refracted waves intersect at the distance *x = 2a√3* calculate the travel times of the reflected and critical refracted waves at *x = a, 3a*, and *5a*. (17 ½ Marks)

**QUESTION 5**

Consider a semi-infinite medium in which the velocity increases linearly with depth according to the expression *v = 4 + 0.1z*. There is a seismic focus at a depth of 10 km. Calculate the epicentral distance reached by a wave leaving the focus at an angle of 30o. (17 ½ Marks)