

**BSMN 425: IMAGING GEOPHYSICS**

**STREAM: Y4S2**

**TIME: 2 HOURS**

**DAY:**

**DATE:**

**INSTRUCTIONS**

- 1. Do not write anything on this Question paper.**
- 2. Answer Question ONE and any other TWO questions.**

**QUESTION ONE: 30 MARKS**

- a) Explain the basic principle of the following techniques as methods of geophysical imaging.
- i) Induced polarization. (2 Marks)
  - ii) Self-potential. (2 Marks)
- b) What is geotechnical geophysics as applied in geophysical imaging.  
(1 Mark)
- c) Explain the following geophysical methods as used to investigate and image engineering structures and their foundations. You may use diagrams to illustrate.
- i) Seismic reflection. (5 Marks)
  - ii) GPR (Ground Penetrating Radar) (5 Marks)

- iii) Magnetism (5 Marks)
- d) Explain the use of electrical resistivity as a site exploration method for engineering purposes. (3 Marks)
- e) Explain seismic refraction method as used in site exploration for imaging engineering structures. (3 Marks)
- f) Outline advantages of geophysical field methods to investigate and image transportation structures and their foundations. (4 Marks)

**QUESTION TWO: 20 MARKS**

- a) Explain two problems in spectral analysis of surface waves (SASW) as applied in imaging geophysics. (6 Marks)
- b) Explain two advantages of spectral analysis of surface waves technique as used for imaging engineering structures. (4 Marks)
- c) Describe data acquisition in spectral analysis of surface waves. (5 Marks)
- d) Explain the use of spectral analysis of surface waves (SASW) to image and determine pavement thickness. (5 Marks)

**QUESTION THREE: 20 MARKS**

- a) Describe the use of common-offset Rayleigh wave method to image fracture zones and associated voids for engineering purposes. (8 Marks)
- b) For common-offset Rayleigh wave method, sketch a diagram to show Rayleigh wave particle motion and displacement. (6 Marks)

- c) Explain the advantages of common – offset Rayleigh wave method as used to image subsurface features for engineering purposes. (8 Marks)

**QUESTION FOUR: 20 MARKS**

- a) Discuss in detail the role of various geophysical methods in solving geotechnical problems. (8 Marks)
- b) In borehole seismic survey, differentiate between down-hole survey and cross-hole survey. (6 Marks)
- c) Explain applications of Electromagnetic Methods (EM) technique in imaging the Earth's subsurface for construction purposes. (7 Marks)

**QUESTION FIVE: 20 MARKS**

- a) Explain the basic concept of the Sonic Echo (SE) as a surface NDT (Non-destructive Tests) method when imaging and determining the unknown depths of subsurface bridge system. (4 Marks)
- b) Describe the procedure employed when carrying out subsurface imaging using seismic refraction method. Clearly state the mathematical expressions. (8 Marks)
- c) Describe the procedure employed in electrical resistivity method during site imaging for engineering structures. Clearly state the mathematical expressions. (8 Marks)