UNIVERISTY EXAMINATIONS

2013/2014 ACADEMIC YEAR

FIFTH YEAR FIRST SEMESTER EXAMININATION

FOR THE DEGREE OF

<u>BACHELOR OF SCIENCE</u>

IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CVS 531E

COURSE TITLE: ENGINEERING DISASTERS

INSTRUCTIONS

- Answer FOUR questions ONLY
- Marks for each question are indicated in the parenthesis

1.   (a)   Engineers respond to a customer's need by building or creating something along a certain set of guidelines which performs a given function.

(i)   Outline the primary cause of Engineering disasters   **[5 marks]**

(ii)   Outline the responsibilities of a Civil engineer in engineering disaster amelioration   **[5 marks]**

(b)   Outline FOUR categories of risks that can occur in any engineering project   **[4 marks]**

(c)   Outline the characteristics of slide prone slope profiles   **[6 marks]**

2.   (a)   The risk from a potential hazard is expressed as follows
$$\text{Risk} = \frac{\left(\text{Hazard} \times \text{Vulnerability}\right)}{\text{Management}} ....Equation\ (1)$$

(i)   By use of neat sketches, distinguish clearly between risk and disaster   **[4 marks]**

(ii)   How would the risk factor in **equation (1)** be minimized   **[6 marks]**

(b)   (i)   With reference to surface elevation and ground roughness, compare and contrast the gust wind characteristics in an urban area and a rural area   **[5 marks]**

(ii)   Discuss the nature of disaster hazard inflicted by strong winds on a built environment   **[5 marks]**

3.   The passage below describes one possible scenario of a cyclone disaster

Poverty and Disaster- A cyclone in India

A wealthy and poor family live 100 meters apart near the coast of southern India. The wealthy family has six members, a brick house, six cattle and three acres of land. The head of the household owns a small grain business and has a truck.

The poor family (husband, wife and two children) has a thatch and pole house, an ox and calf, half an acre of poor land and sharecropping rights for another quarter of an acre.

When the cyclone strikes, the wealthy family has received a warning on its radio and leaves the area with its valuables in the truck.

The storm surge (flood) partly destroys his house and the roof is taken off by the wind. Three cattle are drowned and his fields are flooded, destroying the crops.

The youngest child of the poor family is drowned; their house destroyed; both animals are drowned; their fields are flooded and the crops ruined

The wealthy family uses their savings to rebuild the house within a week. They replace the cattle and plough and replant their field.

The poor family does not have savings and has to borrow money for essential shelter from a local money lender, at exorbitant rates of interest. They manage to buy a calf but have to hire bullocks for ploughing their field, which they do too late since many others are in the same position and draught animals are in short supply. As a result they go through a hungry period eight months after the cyclone.

By using relevant examples from the above passage, define the following terms

[20 marks]

  (i) Natural hazard or danger
  (ii) Natural disaster
  (iii) Economic disaster
  (iv) Society
  (v) Human loss
  (vi) Economic loss
  (vii) Vulnerability
  (viii) Structural and non-structural measures
  (ix) Disaster management
  (x) Disaster preparedness

4. (a) (i) Explain briefly by giving suitable examples the difference between slow and fast disasters   **[4 marks]**

    (ii) Explain the two main purposes of flood risk statement   **[2 marks]**

  (b) Expenditure on flood prevention and mitigation measures may be computed by the following model

$$Y = \sum_{J}^{N} y_i = \sum_{j=1}^{N} \left(\frac{99}{100}\right)^{j-1} \left(\frac{1}{100}\right) \frac{X}{\left(1+\dfrac{i}{100}\right)^{j-1}}$$

  (i) Define the Symbols N, j, i, y_j and Y   **[5 marks]**

  (ii) The economic life of a project is 4 years. If the annual rate of return is 4.5%, calculate the expenditure to be allocated for flood mitigation measures in each year of the project life, if the value of the project is KShs. 1500 million

    [8 marks]

(iii) What is the proportion of the total amount allocated for flood mitigation over the 4 years as a percentage of the total project cost? **[1 marks]**

5. (a) Mass movement refers to the movement of material that is influenced by gravity

    (i) Outline FOUR characteristics of mass movement **[4 marks]**

    (ii) Outline FOUR types of mass movements **[4 marks]**

    (iii) How can slope failure be avoided **[6 Marks]**

  (b) Discuss the mitigation measures against wind disasters **[6 Marks]**