UNIVERSITY OF EMBU

2016/2017 ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURE AND BACHELOR OF SCIENCE RANGE MANAGEMENT

AEB 202: STRUCTURES AND MATERIALS

DATE: APRIL 11, 2017 **TIME: 11:00AM-1:00PM**

INSTRUCTIONS:

Answer Question ONE and ANY other TWO Questions

QUESTION ONE

a) Explain the importance of geotechnical factors in building design. [3 marks]

b) Discuss the classification of forces on a store floor during loading or unloading as either live or dead load. [3 marks]

c) Given that the amount of cement to be used to make a concrete is one bag, calculate the amount of water required assuming that the nominal mix is 1:2:4. [3 marks]

d) What is the difference between the yield strength and ultimate strength of a material? [3 marks]

e) Estimate the number calf pens for a zero grazing farmer that has 15 milking cows. [3 marks]

f) Discuss roofing material and roof slopes in relation to protection of a farmstead against fires. [3 marks]

g) A steel column is under tension. If the beam has a cross-section area of 80 mm^2 and is under a force of 4 kN. What is the stress in the column? [3 marks]

h) Discuss the expected lifespan of a farm structure in accordance with the standard code. [3 marks]

i) With the aid of a diagram describe the cantilever retaining wall. [3 marks]

j) A six metre beam is simply supported at its ends and has a point load of 6 kN at its centre. Calculate the reactions at each support and draw the shear force diagram. [3marks]

QUESTION TWO:

a) Produce the top, front and side view of Figure Question Two. [6 marks]

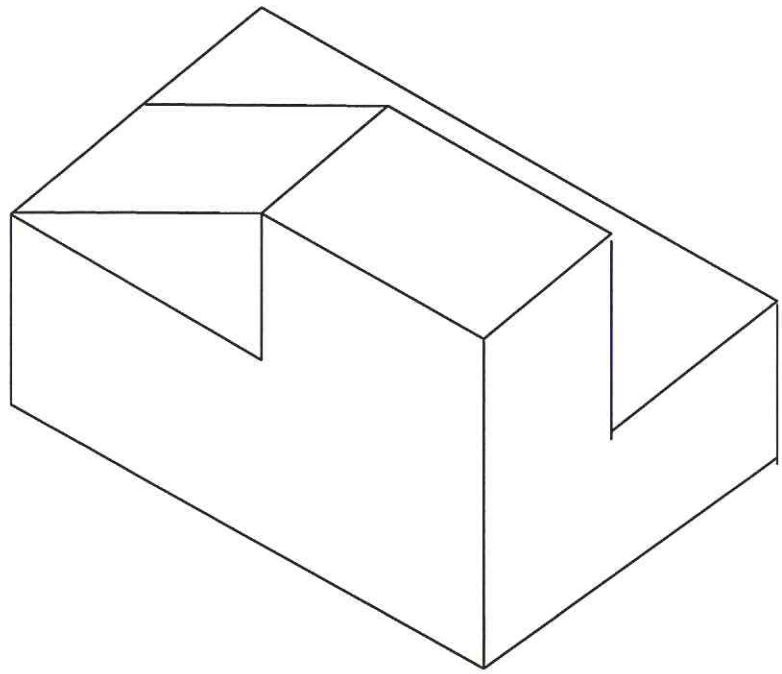

Figure Question Two: Isometric drawing.

b) A concrete of nominal mix 1:1.5:2.5 is to be made. This concrete is used to make a slab of area 15 x15 metre square and of thickness 180 mm. Calculate the amount of materials required to make this concrete by assuming that all materials have the required moisture content. [10 marks]

c) Describe the silt tests used to determine the quality of the sand used in concrete making. [4 marks]

QUESTION THREE

a) Explain how the following aspects are catered for in the design of animal housing.

i. Biology of the animal [4 marks]

ii. The engineering properties of the materials (4 marks]

iii. The economics of production. [4marks]

b) With the aid of diagrams discuss the size and shape of the waste disposal pit for a farmer who has 10 cows. Assume that each cow produces 10 kg of manure whose density is 800kg/m^3 and storage period is 30 days. [8 marks]

QUESTION FOUR

a) After using the cube test to crush 100 concrete blocks, the crushing strength of concrete was found to be 20.4 N/ mm^2. Explain the meaning of this finding in terms of probability.

[5 marks]

b) A foot-in-foundation is to be provided for a total downward force of 2 kN while the soil bearing capacity is 270 kN/m^2. Determine an appropriate dimension of the square footing.

[10 marks]

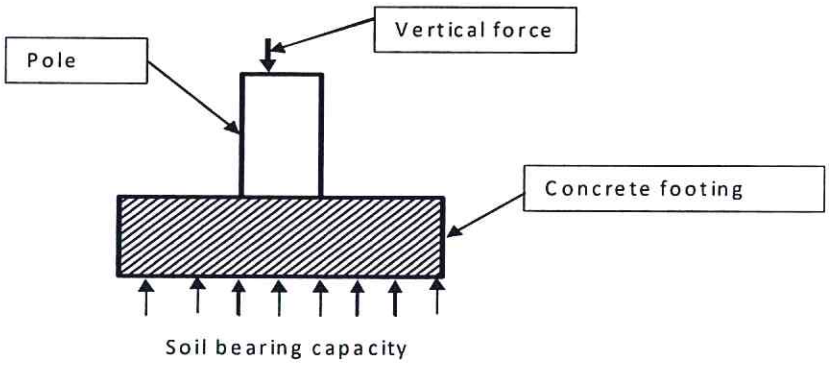

Figure Q4 Section drawing of foot-in-foundation column

c) Explain the importance of a concrete footing along the main walls of a single floor building. [5 marks]

QUESTION FIVE

Calculate the x-section dimensions of the timber beam that can safely carry the load on the beam shown below in Figure Q5. Both F1 and F2 are 4kN each and the distance between R1 and F1, F1 and F2 and F2 and R2 is two metres. The working stress is 8N/mm2. [20 marks)

Figure Q5. A simply supported beam at both ends carrying two point loads

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