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University Examinations 2013/2014

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN CIVIL
ENGINEERING

ECV 0245: HIGHWAY ENGINEERING I

DATE: APRIL 2014

TIME: 1 ½ HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE – (30 MARKS)

- (a) Briefly describe the process of setting – out prior to starting earthworks in a road construction project. (4 Marks)
- (b) By use of a sketch, explain the term ‘cut-and-fill’ as used in road construction. (2 Marks)
- (c) What is the function of a capping layer in road construction? (1 Mark)
- (d) What do you understand by the term fascine construction? In what circumstances is it applicable in highway construction? (2 Marks)
- (e) State any two (2) functions of geotextile synthetic fabric separation in pervious soils during road construction. (2 Marks)
- (f) State any three (3) methods used in drying out water logged ground during road construction. (3 Marks)
- (g) Explain how traffic loading affects pavement design. (2 Marks)
- (h) Describe the set-up of the following methods of controlling the alignment for excavation of drainage trenches. (3 Marks)
 - (i) Pin and line method
 - (ii) Chalk line method
- (i) Name and explain how the basic resources of production could be optimized during road construction. (4 Marks)
- (j) Differentiate the terms planning, programming and organizing as used in management of construction works. (3 Marks)

- (k) What measures would you advise a contractor to put in place in order to improve financial soundness during construction. (3 Marks)

QUESTION TWO – (15 MARKS)

A road is to be constructed to link MUST to Maua – Meru highway with the following parameters:

- (i) Road reserve = 10m wide
- (ii) Carriage way length = 1.5km
- (iii) Carriage way width = 5m
- (iv) Average depth of black cotton soil = 0.35m
- (v) Hard material = 20% of soft material
- (vi) Surfacing = 80mm thick paving blocks
- (vii) Carriage way restrained by kerbs on both sides
- (viii) 3% stabilization lime for the base
- (ix) Stone – pitched open drain on one side of the road (600mm deep by 400mm wide)
- (x) 10 no access culverts each measuring 5m long (size \varnothing 600mm)

The road is to be constructed on initially cultivated land, fully overgrown by vegetation, with approximately 30 trees. It is proposed that all the black cotton soil be excavated to spoil, new material to be sourced to fill up to the original ground level and a 200mm lime-stabilized gravel base be constructed above it. Based on the above data, prepare a sample un-priced bill of quantities for the following items:

- (a) Site clearance
- (b) Tree cutting
- (c) Cut to spoil in soft material
- (d) Cut to spoil in hard material
- (e) Fill in soft material
- (f) Construction of road base
- (g) Surfacing
- (h) Lime
- (i) Drainage

QUESTION THREE – (15 MARKS)

- (a) Highlight the main stages during the procurement process of construction works. (6 Marks)
- (b) Name four (4) elements that constitute a ‘contract’. Name any six documents comprising a contract document for construction works. (5 Marks)

- (c) Clearly distinguish between 'cost + fixed percentage and 'cost + fixed fee' contracts types. Give merits and demerits of each of the contracts. (4 Marks)

QUESTION FOUR – (15 MARKS)

- (a) By use of a sketch, highlight the structural and functional purposes of pavement layers and give typical materials used in constructing each layer. (10 Marks)
- (b) Highlight the constructional differences and similarities between a rigid and flexible pavement. (5 Marks)