PWO – Surveying and Cost Estimation

T115

Wednesday, 18/11/2015

08:30 – 11:30

WORKFORCE DEVELOPMENT AUTHORITY

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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015, TECHNICAL AND PROFESSIONAL TRADES

EXAM TITLE: **Surveying and Cost Estimation**

OPTION: **Public Works (PWO)**

DURATION: **3hours**

INSTRUCTIONS:

The paper is composed of **three (3) Sections**:

Section **I**: Sixteen **(16)** questions, all **Compulsory**. **55marks**

Section **II**: Five (5) questions, **Choose Three (3) only**. **30marks**

Section **III**: Two (2) questions, **Choose only One (1)**. **15marks**

The use of calculator is admitted

Every candidate is required to strictly obey the above instructions. Punishment measures will be applied to anyone who ignores these instructions.

Section I. Sixteen (16) Compulsory questions. **55marks**

01. Define the following:

a) Bench mark

b) Sight of line **2marks**

02. Using sketches of staff leveling, indicate the following readings

a) 1.450

b) 3.050

c) 0.200

d) 2.770 **4marks**

03. Find the sum of interior included angles of pentagon. **2marks**

04. Pick out the correct statement:

a) In leveling, the reading to consider is :

- ❖ The reading taken on upper stadia
- ❖ The reading taken on upper stadia
- ❖ The reading taken on the medium of cross hours.

b) The formula to calculate the horizontal distance (HD) between the instrument and staff leveling during leveling on flat terrain is demonstrated as follow :

- ❖ HD= the height of instrument (HI)*100
- ❖ HD=the height of staff (HS)*100
- ❖ HD=the height of tripod (HT)*100
- ❖ HD= the stadia interval*100

c) In leveling, the formula to calculate the height difference (ΔH) between 2 selected points is demonstrated as follows :

- ❖ ΔH= Fore sight (FS)-Back sight (BS)
- ❖ ΔH= upper reading (UR)-lower reading (LR)
- ❖ ΔH= Back sight (BS)-Fore sight (FS) **3marks**

05. A roof has an area of 180m^2, calculate the number of metal sheets if the metal sheet dimension is 3.00mx0.67m and the overlapping is 10cm both sides. **5marks**

06. Define the following terms:

a) Notification

b) Bill of quantity

c) Contractor

d) Material

e) A defect **5marks**

07. What is the role (function) of a quantity surveyor on the site? **5marks**

08. A, B and C are points on line AD on a sloping ground. The distances between the points are measured by a tape and the corresponding inclination angles and slopes are given below.

Line	**Slope distance (m)**	**Inclination angle**
AB	75	5^0
BC	30	15^0

Calculate the horizontal distance of line AC. **5marks**

09. How to control readings taken on staff during leveling? **1mark**

10. Define the following terms:

a) Budget
b) Cost
c) Profit
d) Fixed cost **4marks**

11. What is the difference between direct costs and indirect costs? **2marks**

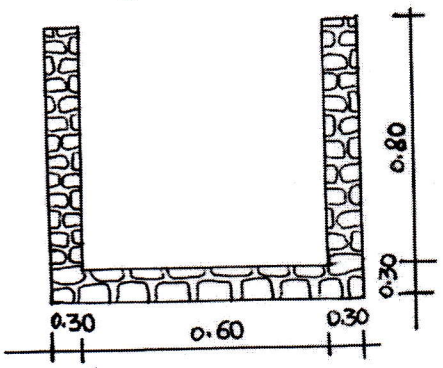
12. What is the aim of bill of quantity? **3marks**

13. What are the forms in which the dimensions are entered on the dimension paper? **5marks**

14. List any two (2) methods used to measure a horizontal angle. **2marks**

15. List any four (4) various measurement techniques which are used to found the area of irregular shapes. **4marks**

16. A rectangular drain in stone masonry is represented below.

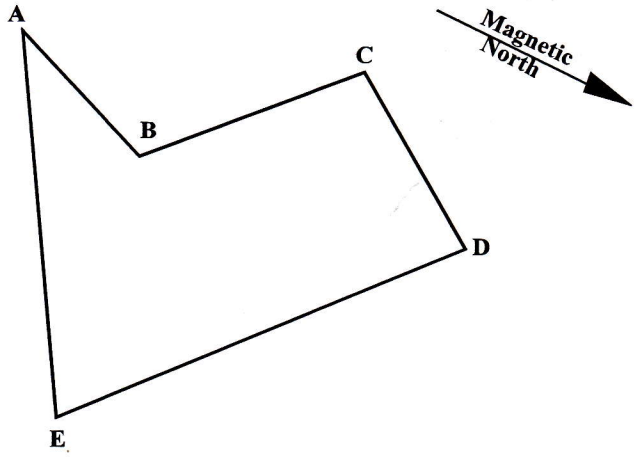


a) Calculate the quantity of stone masonry for 4m length.
b) Find the total cost for 60000Rwf/m^3. **3marks**

Section II. Answer any three (3) questions of your choice

(Do not choose more than three questions). 30marks

17. The figure below shows a compass traverse. Assuming that A is a convenient point at which to start operations, describe how the traverse will be carried out.



10marks

18. Organize the steps below on a flow chart to outline the process of cost checking:

- Design cost checked by Quantity surveyor
- Cost of element is within target
- Design changed to bring it within the cost limit
- Details prepared by architect
- Finish cost check
- Cost target found to be unrealistic.
- Cost of element exceeds target. **10marks**

19. Assume that a hospital has been built with the following floor areas (measured within external walls):

- Ground floor plan: 750 m^2
- First floor plan: 750 m^2

If the total cost of the hospital at handover is 750,000,000 FRW:

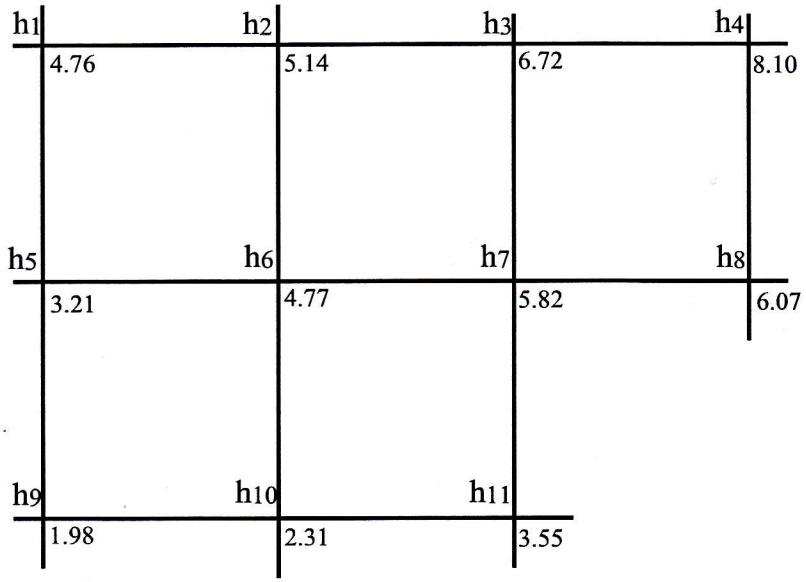
i) Find the cost of the hospital expressed in terms of price per m^2 of floor area.

ii) If the hospital project intended to cater for 200 patients, find the unit cost of each hospital bed.

iii) If one bed occupies $4m^2$, compare the two unit costs. **10marks**

20. The figure below shows a 10m square grid with the depths of cut marked at each grid intersection. Assume that the surface slope is constant between grid intersections.

i) Calculate the volume contained in square grid h1 h2 h6 h5.



ii) Sketch the grid in 3 isometric dimensions. **10marks**

21. Cost estimation can be carried out in different ways depending on the purpose. Discuss briefly the following cost estimating techniques:

a) unit method,
b) cube method,
c) storey enclosure method,
d) superficial method
e) elemental cost analysis method. **10marks**

Section III. Answer any one (1) question of your choice

(Do not choose more than <u>one question</u>). 15marks

22. A residential house, covered by a lean-to-roof, measures 12m to 8m of length and width respectively. If the roof slopes on the width side and wall heights are 4m and 6m for short and high walls respectively:

i) Sketch the building in isometric view and short side elevation.

ii) If the external finishing of the house consists of ceramic tiles, what will be

their cost for a price of 10,000 FRW/m^2 if the total external openings area is 10% of the floor area? **15marks**

23. A level survey has been carried out during a road construction. The data recorded are shown in the table below, with all readings in meters. The chainage of the points is also given (distance from beginning).

station	Point	BS	IS	FS	RISE	FALL	RL	CH
1	X1	1.250					+25.000	0.00
1	X2		1.050					5.00
1,2	X3	1.435		0.885				10.00
2	X4		1.520					15.00
2,3	X5	0.650		1.625				20.00
3	X6			1.835				25.00

i) Reduce the data using the Rise and Fall method. Use simple arithmetic checks to support your answer.

ii) Plot the longitudinal soil profile (height against distance) and indicate where excavation or fill is needed if the proposed finished level of the road starts from +24.500m at X1, and rises with a slope of 2% from X1 to X6.

15marks

24. Prepare an approximate estimate of building project with a total plinth area of entire building of 800 m^2. Consider following data:

i) Plinth area rate 450,000 FRW per m^2

ii) Cost of water supply at 7½% of cost of building.

iii) Cost of Sanitary and electrical installations each at 7½% of cost of building.

iv) Cost of architectural features at 1% of building cost.

v) Cost of roads and lawns at 5% of building cost.

vi) Cost of contingencies at 4% of building cost.

Assume supervision charges to be 8% of overall cost.

15marks