

SUR - Surveying Applications

T116

Monday, 16/11/2015

08:30 – 11:30

WORKFORCE DEVELOPMENT AUTHORITY



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**ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015,
TECHNICAL AND PROFESSIONAL TRADES**

EXAM TITLE: Surveying Applications

OPTION: Surveying (SUR)

DURATION: 3hours

INSTRUCTIONS:

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

Section I: Fourteen (14) questions, all **Compulsory.** **55marks**

Section II: Four (4) questions, **Choose Three (3) only.** **30marks**

Section III: Three (3) questions, **Choose only One (1).** **15marks**

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

Section I. Fourteen (14) Compulsory questions

55marks

01. What do you understand by theodolite? **4marks**
02. List at least three (3) important lines or axes of theodolite. **3marks**
03. What do you understand by setting out? **4marks**
04. What is traversing? **4marks**
05. State two (2) types of traversing. **4marks**
06. Give the difference between:
- a) bearing and azimuth
 - b) departure and latitude.
07. What is contour interval? **4marks**
08. Mention at least three factors you will consider while choosing proper contour interval. **3marks**
09. List two methods of locating contours as used in topographic survey. **4marks**
10. What does the term GPS stand for? **3marks**
11. Enumerate at least four (4) GPS applications. **4marks**
12. If areas calculated by end - areas rule and prismatic rule are A_e and A_p respectively, then $(A_e - A_p)$ **4marks**
- (a) is always positive;
 - (b) Is negative;
 - (c) May be positive or negative;
 - (d) is equal to zero.
13. Prismatic correction is required to correct the volume calculated. **4marks**
- (a) using contours;
 - (b) using spot heights;
 - (c) for a curved section;
 - (d) by end-areas rule.
14. List down at least six essential parts of the transit theodolite. **6marks**

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

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

15. For the Location of the weir, initially it is difficult to decide on the location of the proposed structure without having topographic maps of the project area and layout of the river course. However, by walking along the river up and down of the location where the existing intake is or where the farmers believe it is an appropriate location; it is possible to identify a few places for the proposed structure. What are ten (10) factors to be conceded by a technician, in selecting the structure site? **10marks**

16. Classification of surveying may be done basing on surveying techniques used.
 (i) Enumerate at least five (5) classes basing on principal surveying techniques.
 (ii) Specify five technical uses of contours. **10marks**
17. The following readings were observed with a level: 1.143 (BM 112.28), 1.765, 2.566, and 3.820 CP; 1.390, 2.262, 0.664, and 0.433 CP; 3.722, 2.886, 1.618, and 0.616 TBM.
 i) Reduce the levels by the R-and-F method.
 ii) Calculate the level of the TBM if the line of collimation was tilted upwards at an angle of 6' and each BS length was 100 m and FS length 30 m.
 iii) Calculate the level of the TBM if the staff was not held upright but leaning backwards at 5° to the vertical. **10marks**
18. In the checklist table below, indicate the components to be evaluated.

SN	Initial Site appraisal check list	Please indicate at least 4 components of each check list
1	Site Access Check list	a)
		b)
		c)
		d)
2	Service check list	a)
		b)
		c)
		d)
3	Topography check list	a)
		b)
		c)
		d)
4	Environmental check list	a)
		b)
		c)
		d)

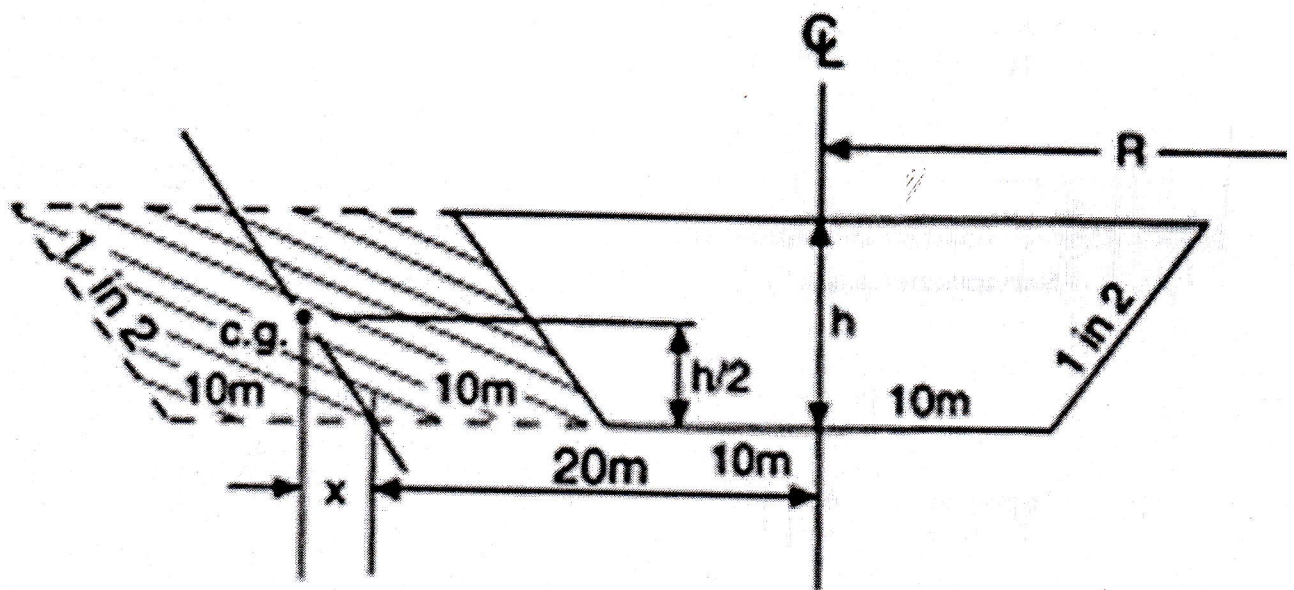
10marks

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

(Do not choose more than one question). 15marks

- 19.** A length of existing road of formation width 20 m lies in a cutting having side slopes of 1 vertical to 2 horizontal. The centre-line of the road forms part of a circular curve having a radius of 750 m. For any cross-section along this part of the road the ground surface and formation are horizontal. At chainage 5400 m the depth to formation at the centre-line is 10 m, and at chainage 5500 m the corresponding depth is 18 m.

The formation width is to be increased by 20 m to allow widening the carriageway and for constructing a parking area. The whole of the widening is to take place on the side of the cross-section remote from the centre of the arc, the new side slope being 1 vertical to 2 horizontal. Using the prismatic rule, calculate the volume of excavation between the chainages 5400 m and 5500 m. Assume that the depth to formation changes uniformly with distance along the road.



Situational illustrative figure.

15marks

20. a) Give at least 5 information that can be found by the use of Mass-Haul Diagram (MHD) methods
- b) Explain the following MHD related terms
- i) Hall
 - ii) Station metre
 - iii) Waste
 - iv) Borrow
 - v) Limit of economic hall
- c) The volumes between sections along a 1200-m length of proposed road are shown below.
- Positive volumes denoting cut, and negative volumes denoting fill

Chainage (m)	0	100	200	300	400	500	600	700	800	900	1000	1100	1200
Vol. between sections ($m^3 \times 10^3$)	+2.1	+2.8	+1.6	-0.9	-2.0	-4.6	-4.7	-2.4	+1.1	+3.9	+43.5	+2.8	

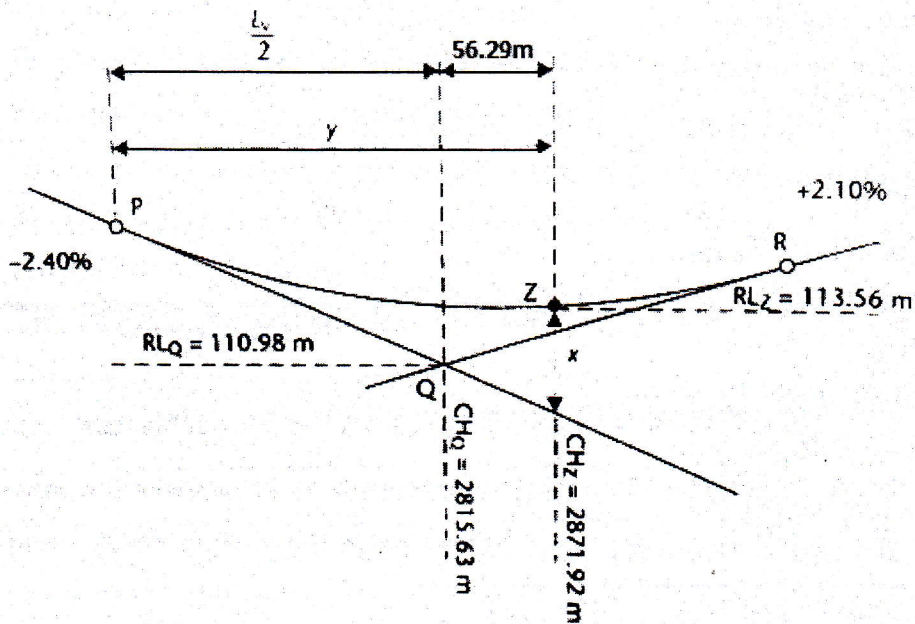
Plot a MHD for this length of road to a suitable scale and determine suitable positions of balancing lines so that there is

- (1) A surplus at chainage 1200 but none at chainage 0.
- (2) A surplus at chainage 0 but none at chainage 1200.
- (3) An equal surplus at chainage 0 and chainage 1200.

15marks

21. A parabolic vertical curve having equal tangent lengths is to connect a falling gradient of 2.4% to a rise gradient of 2.10% on a road designed for a speed of 100kph. The length of curve used must be at least enough to ensure that the minimum K value is 26. In order to ensure that there will be sufficient clearance over a culvert, the curve must pass through a point Z through chainage 2871.92 m and reduced level is 113.56 m.

The reduced levels through chainage of the point of intersection Q of the two gradients are 110.98 m and 2815.63m, respectively. See the figure below.



Calculate the length of vertical curve that will meet these requirements. **15 marks**