PWO – Topography and Road Construction

T020

Monday, 14/11/2016

08:30 – 11:30

WORKFORCE DEVELOPMENT AUTHORITY

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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2016, TECHNICAL AND PROFESSIONAL STUDIES

EXAM TITLE: **Topography and Road Construction**

OPTION: **Public Works**

DURATION: **3hours**

INSTRUCTIONS:

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

Section I: Sixteen (16) compulsory questions.	**55 marks**
Section II: Attempt **any three (3)** out of five questions.	**30 marks**
Section III: Attempt **any one (1)** out of three questions.	**15 marks**

Allowed materials:

- Ruler and square
- Graph paper inside answers booklet
- Calculator

Note:

Every candidate is required to carefully comply with the above instructions. Penalty measures will be applied on their strict consideration.

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

01. The downhill end of a 30 m tape is held 90 cm too low. What is the horizontal distance measured? **5marks**

02. While measuring the distance on a sloping ground, it was found that the ground rises by 3.20 m for each 20 m chain length. Find the angle of slope (Ø). **2marks**

03. It is required to connect two stations on the top and the other on the foot of the hill. If the scale of the map is 1/2000, ruling gradient is 1 in 20, calculate the length of the road between 2 consecutive contour lines. **3marks**

04. In road construction technology, carry out the classification of curves. **6marks**

05. What are the three (3) methods of attainment of super elevation? **3marks**

06. What are the three (3) tests used to evaluate the strength of properties of soil? **3marks**

07. Name the types of pavement structures based on the structural behavior. **2marks**

08. List any five (5) elements of geometric design of highway. **5marks**

09. In surveying, what are the two (2) kinds of ranging? **2marks**

10. Define the following terms in topography:

a) Chainage b) Offset c) Clinometer **3marks**

11. For road construction, what are the five (5) advantages of asphaltic concrete? **5marks**

12. Calculate the value of:

a) Head light sight distance (stopping sight distance SSD) and

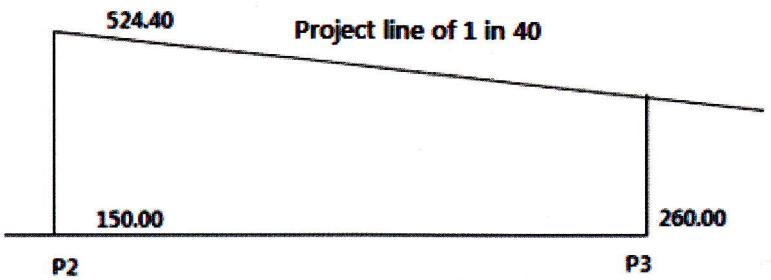
b) Intermediate sight distance on a highway with design speed (V) of 65 km PH. Assume skid resistance (f) = 0.36 and total reaction time (t) = 2.5 seconds. **5marks**

13. What are the three (3) major methods of interpolation during road project study on a topographic map? **3marks**

14. What are the two (2) types of longitudinal profiles (profile leveling)? **2marks**

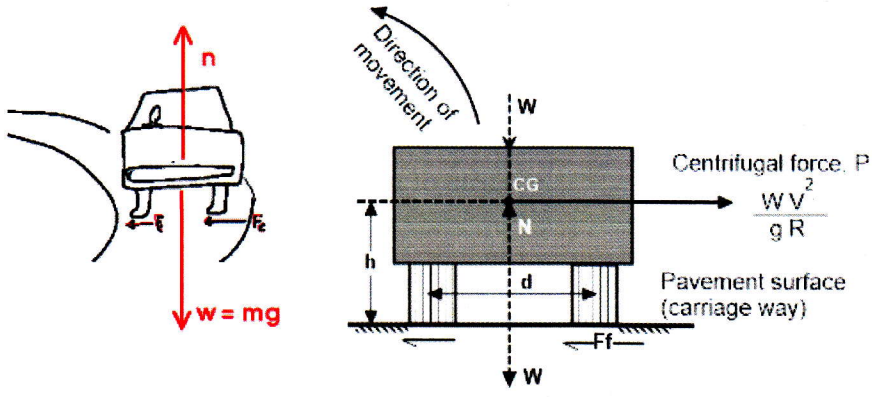
15. Mention the three (3) types of sight distances. **3marks**

16. If the figure below shows a part of longitudinal profile of the project, calculate the elevation of P3. **3marks**



Section II. Choose and answer any three (3) questions. **30marks**

17. The figure below shows different types of forces acting on a vehicle negotiating a horizontal curve on a level carriage way. What is the meaning of following parameters?



(1) m (8) R
(2) f (9) V
(3) Ff (10) W
(4) g
(5) h
(6) N
(7) d **10marks**

18. Discuss two (2) reasons why an extra widening of the road on horizontal curve is required. **10marks**

19. (a) How does the final road location survey differ from the preliminary one? Describe the final road location survey by highlighting different five (5) activities involved.

(b) Discuss four (4) considerations of engineering survey during final road location survey. **10marks**

20. Classify different types of road intersections according to:

a) Functions b) Geometric features c) Shape. **10marks**

21. Make use of neat sketches to differentiate between the following:

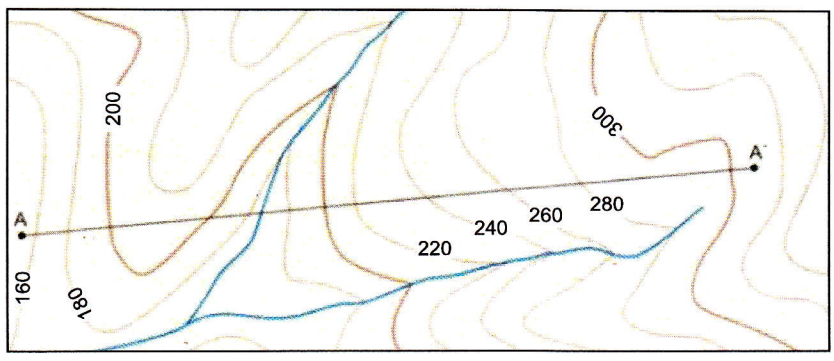
(a) Cross-section for rural roads on embankment

(b) Cross-section for rural roads in cut terrain. **10marks**

Section III. Choose and answer any one (1) question. **15marks**

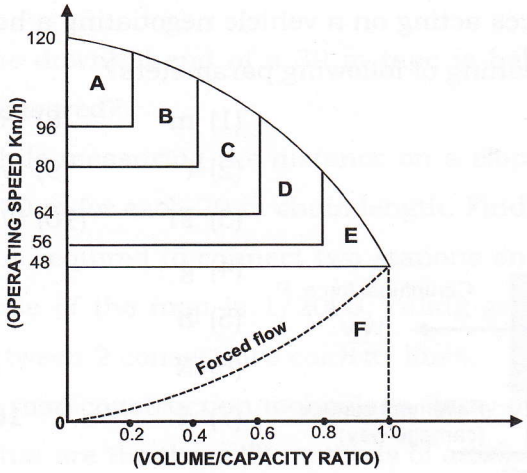
22. (a) Briefly explain steps involved in generating a longitudinal profile from a topographic map.

(b) Given below portion of a topographic map, generate a longitudinal profile as shown by line AA' (elevations in meters).



15marks

23. Make observation of the graph below about different levels of service of a highway.



Required:

(a) Briefly discuss about levels of service A, B, C, D, E and F.

(b) With respect of the above graph, what are six (6) factors affecting capacity and service volume of a highway?

15marks

24. Shown below are images of types of flexible pavement road failure. In a tabular format, name them and mention different cases under each type.

Types of flexible pavement deformation		
①.....	②.....	③.....
1) 2) 3) 4) 5) 6) 7)	1) 2)	1) 2) 3) 4)

15marks