9210-201
Level 7 Post Graduate Diploma in Civil Engineering
Construction engineering and management

Sample Paper

You should have the following for this examination
• one answer book
• non-programmable calculator
• pen, pencil, ruler

General instructions
• This paper consists of nine questions.
• Answer any five questions.
• A non-programmable electronic calculator may be used but candidates must show sufficient steps to justify their answers.
• Drawings should be clear, in good proportion and in pencil. Do not use red ink.
• All questions carry equal marks. The maximum marks for each section within a question are shown.
1. a) Explain the purpose of conducting subsoil investigation for a building construction project. (5 marks)
   b) List any four facilities which are to be provided by the contractor to the site from the beginning of the construction. (4 marks)
   c) Explain briefly the importance of physical site layout before commencing construction activities. (5 marks)
   d) Select six main activities in stores management of a construction project. (6 marks)

2. It is proposed to construct reinforced cement concrete drains along both sides of an existing main road as depth and width of the existing drains are not sufficient.
   a) i) Outline all construction activities in this drain construction. (6 marks)
       ii) Propose suitable machinery for relevant work items. (4 marks)
       iii) Find out information from the specification for carrying out concrete work. (5 marks)
   b) State five methods of removing water when constructing below the groundwater table. (5 marks)

3. a) i) Discuss the factors which are to be considered when selecting machinery for earth cutting and filling operations in a major road project. (6 marks)
       ii) Justify the suitability of a scraper for a road project. (5 marks)
   b) State three tests to determine the performances of a pile foundation. (3 marks)
   c) Discuss the types of excavation in laying the foundation of a building. (6 marks)

4. a) Soil is to be placed and compacted for the construction of the embankment of a dam.
       i) Give two main objectives of compacting earth. (2 marks)
       ii) Find the mechanisms used by machines to apply forces to compact earth. (4 marks)
   b) Describe briefly the use of a motor grader when carrying out dam construction. (4 marks)
   c) i) State the main steps in rock blasting. (3 marks)
        ii) Briefly explain the steps stated in c) i) above. (5 marks)
        iii) Identify suitable machinery for the rock blasting process. (2 marks)

5. a) Illustrate a cross section of a major road and name all components of the road structure. (10 marks)
   b) Explain briefly construction activities in asphalt concrete. (6 marks)
   c) State the advantages of concrete block paving for rural roads. (4 marks)

6. a) i) What is meant by concrete mix design? (3 marks)
       ii) List the factors which are to be considered in concrete mix design. (4 marks)
   b) i) Illustrate briefly the use of scaffolding in high rise building construction. (4 marks)
       ii) Illustrate the arrangement of independent scaffold placing parallel to one side of a building by sketching plan view and side elevation. (6 marks)
       iii) Name three main components in b) ii) above. (3 marks)

7. a) Give four factors which affect workability of cement concrete. (4 marks)
   b) Explain briefly,
      i) setting of cement concrete (4 marks)
      ii) curing of cement concrete. (4 marks)
   c) i) Describe crushing strength of hardened concrete. (4 marks)
       ii) Identify different types of admixtures used in cement concrete. (4 marks)
Identified activities, their durations and proposed unskilled labour strength for construction of a box culvert are given below.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Duration (Days)</th>
<th>Unskilled Labour (Nos)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Excavation for foundation</td>
<td>4</td>
<td>08</td>
</tr>
<tr>
<td>2) Mass concrete for foundation</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>3) RR Masonry</td>
<td>15</td>
<td>08</td>
</tr>
<tr>
<td>4) Back filling around foundation</td>
<td>5</td>
<td>05</td>
</tr>
<tr>
<td>5) Form work for concrete capping beams and deck</td>
<td>2</td>
<td>02</td>
</tr>
<tr>
<td>6) Placing reinforcement for beam and deck</td>
<td>3</td>
<td>03</td>
</tr>
<tr>
<td>7) Grade 20 concrete for capping beams and deck</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>8) Fixing pre-cast guard stones</td>
<td>2</td>
<td>04</td>
</tr>
<tr>
<td>9) Cement Plastering in exposed area</td>
<td>6</td>
<td>04</td>
</tr>
<tr>
<td>10) Turfing in embankments</td>
<td>4</td>
<td>05</td>
</tr>
</tbody>
</table>

a) Produce Activity on Arrow (AOA) diagram for the above box culvert construction. (6 marks)
b) Derive duration for completion of this construction by analyzing AOA network produced in a) above. (6 marks)
c) Prepare labour histogram for the above box culvert construction. (4 marks)
d) Briefly explain the requirement of a resource plan for the construction project. (4 marks)

9 a) i) Give five basic functions in management. (5 marks)
    ii) Select a function given in a) i) above and identify the role of project manager in this function. (5 marks)

b) Discuss the roles of the contractor during construction stage of the project in;
   i) quality management (5 marks)
   ii) safety management. (5 marks)