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練習題

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Exam : Civil Engineering Technology

**Title : Technical Examination -
Civil Engineering
Technology C.E.T**

Version : DEMO

1. A continuous beam is supported in the middle and at both ends. It has a uniform load applied to the top.

What will be the reactive forces at the supports?

- A. They will be equal at all supports.
- B. They will be greater in the middle than at the ends.
- C. They will be greater at the ends than in the middle.
- D. They will vary depending on whether the supports are fixed or not.

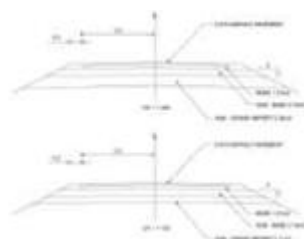
Answer: B

Explanation:

A beam supported at both ends and at an intermediate support is a continuous (statically indeterminate) beam. Under uniform loading, continuity over the interior support creates negative bending moment (hogging) at the middle support and redistributes shear and reactions compared with a simply supported span. Standard structural analysis references note that continuous beams are statically indeterminate and are analyzed using methods such as the three-moment equation to determine reactions and internal moments. For symmetric geometry and uniform load, the interior support typically attracts a larger share of the reaction because continuity restrains rotation and increases load transfer to the middle support. The end supports still carry reaction, but the redistribution generally results in the middle reaction being greater than either end reaction for the common case of an intermediate support under uniform load. Thus, the correct statement is that the reactions are greater in the middle than at the ends.

2. The road cross sections shown have chainage (CH) 1+100 and 1+200.

What is the volume of sub-grade material if an averaging method is applied?



- A. 131 m³
- B. 213 m³
- C. 425 m³
- D. 850 m³

Answer: B

Explanation:

The averaging method for earthworks between two stations is the Average End Area method: Where and are the end areas at the two cross sections and is the station spacing. Here, CH 1+100 to 1+200 gives m. From the cross-section labels in the figure, the two sub-grade areas sum to 4.26 m² (e.g., approximately 1.31 m² and 2.95 m²), so the average area is m². Multiply by length: m³. This is the standard approach used for roadway cut/fill and subgrade volume computations between surveyed sections.

3. Which soil test identifies the minimum water content at which the soil begins to crumble?

- A. Liquid limit
- B. Plastic limit

-
- C. Shrinkage limit
D. Permeability limit

Answer: B

Explanation:

The Atterberg limit boundaries between consistency states of fine-grained soils. The plastic limit (PL) is the water content at the boundary between the plastic and semi-solid states—below this moisture condition, the soil can no longer be rolled/deformed without crumbling, indicating it has transitioned out of the plastic range. Civil engineering references define PL explicitly as the water content corresponding to the transition between the semi-solid and plastic state (i.e., the lower boundary of plastic behavior). Similarly, soils testing references define PL as the boundary between plastic and semi-solid states (with liquid limit defining plastic-to-liquid boundary).

4. A geotechnical report indicates the presence of a peat layer in several boreholes. The peat layer ranges in thickness from 450 mm to 1200 mm and is found at a depth of 1.5 m below the existing grade. How should this be addressed in the project specifications that are being prepared?

- A. Advise the bidders that the peat layer is present
B. Propose a method of stabilizing the peat layer in the specifications
C. Include a clause stating that the peat should be removed from the area
D. Determine the bearing strength of the peat material and include this information in the specifications

Answer: C

Explanation:

Peat is a highly organic soil with very high compressibility, low shear strength, and problematic long-term settlement behavior. If peat is present within the stress influence zone of foundations or slabs (here, relatively shallow at ~1.5 m depth), typical construction practice is to treat it as unsuitable material unless a designed ground-improvement solution is explicitly adopted. When the geotechnical investigation identifies such material in advance, the project specifications should convert that known condition into a clear scope requirement so pricing and execution are defined—commonly by requiring over-excavation/removal and replacement with suitable compacted fill in affected areas, subject to engineer direction and limits. USACE guidance for earthworks/foundations explicitly states that soft or organic spots in the foundation should be removed and replaced with compacted material as part of foundation preparation.

Therefore, the most appropriate way to address the identified peat in the specifications is to include a clause requiring peat removal (and replacement per spec), which is Option C.

5. What is a silt fence used for?

- A. To mark the construction limits of the project
B. To prevent water from moving through the site
C. To prevent the public from accessing the construction site
D. To prevent soil from moving through the site due to erosion

Answer: D

Explanation:

A silt fence is an erosion and sediment control measure intended to retain sediment carried by runoff, reducing offsite sedimentation. Lindeburg describes temporary silt fences as measures using posts and filter cloth (e.g., filter fabric) placed on the upstream side to retain suspended silt particles in runoff water.

This purpose is to reduce soil movement (sediment transport) caused by erosion processes during construction, especially along drainage paths where siltation is expected. The fence does not “stop water” (runoff still passes through while sediment is filtered), is not primarily a site limit marker, and is not an access control barrier for the public.

Therefore, the correct statement is that a silt fence is used to prevent soil from moving through the site due to erosion.