Surprise Quiz (10 marks)  Questions: 4  Time: 10 min

Name: SUMON DAS  
Roll No.: (CE13805)

1. List any two positives and one negative aspect of ready mixed concrete as compared to on site concrete. (3)

- **Positives**
  1. Good quality assurance of concrete
  2. Less labour costs & skill required
  3. Volume batching of quantity can be done properly

- **Negatives**
  1. Degradation of concrete & waste generated on delay in travelling
  2. Large costs to clients

2. List any three activities of concrete construction. (3)

1. Pumping concrete
2. Vibrating concrete
3. Screeding
4. Finishing

3. What is the advantage of a steel concrete composite column over conventional steel column? (2)

- Cost of conventional steel column is more.
- It is exposed to more corrosion compared to steel concrete composite columns.
- Moreover, concrete is good in shear & steel good in tension, so their combination gives the best column good in shear & tension.

4. What is the difference between pre- and post- tensioning? (2)

**Pre-tensioning**
- Tension is applied to steel rebars which is inserted into concrete after it has hardened. By anchoring the bars at ends, when released, the tension is transferred to compressive stress in concrete.

**Post-tensioning**
- The steel rebars are anchored & flexible concrete is flowed allowed to harden. After hardened, the anchors are cut & T steel is transferred to compression in concrete by relaxation of stress.
1. What is the difference between isolated footing and strip footing? What structural members are supported using these? (3)

- Strip footing has a comparatively less depth below ground level as load transmitted is less.
- Isolated footing has different stages of various width & greater depth than isolated, as much load is transmitted.

2. How is a bored pile different from a driven pile? (3)

- In a driven pile, the concrete is directly poured while drilling using Auger.
- In a bored pile, drilling is done, then a bentonite clay or polymer membrane is layered around bore & then concrete is poured into the bore.

3. List the essential steps in a well sinking operation. (4)

1. Dig the ground till certain extent.
2. Lower the boundary using cement & mortar.
4. Finally the entire dugout, the concrete is basically poured around boundary.
1. List the three 'levels of information' that we discussed in class?
   a. Molecules level - Micro level
   b. Materials level - Macro level
   c. Engineering level - Macro level

2. In class, two major reasons for the buckling/bending of railway tracks were discussed. List them?
   a. Temperature effects, i.e., thermal expansion
   b. Lateral forces due to Earthquakes

3. Define 'characteristic compressive strength'? Draw a sketch showing this and label appropriately.

   The safe strength that is allowed for a particular structure beyond which the probability of failure is under acceptable limits is characteristic compressive strength.

   Below this, the structure is likely to fail. It is less than average stress strength.

   ![Sketch of stress vs. number of loads diagram]

   Area shows maximum allowable failure.
1. List two material properties that do not change as a function of geometry.
   i. Young's Modulus \((E)\)
   iii. Poisson's Ratio \((\nu)\)

2. As discussed in class, draw sketch showing both the strain-hardening and strain-softening behaviour (superimpose in one graph).

3. State the difference between Newtonian and Non-newtonian fluids.
   * Newtonian fluids have their rate of deformation is directly proportional to the stress applied. \(\dot{\gamma}\) (shear stress) \& shear rate \(\dot{\gamma}\) (linear relationship).
   They are incompressible \& do not regain strain upon withdrawal of load.
   * Any fluid which does not follow properties of Newtonian fluid i.e. non-linear graph between stress \& shear strain rate \& Non-Newtonian fluid

4. Draw two sketches showing the modulus of resilience and toughness?

5. List the three two-element models used in rheology.
   i. Maxwell's Model (Spring \& dashpot series)
   ii. Kelvin's Model (Spring \& dashpot in Parallel)
   iii. Prandtl's Model (Frictional force \& spring in series)
1. Define liquidus.

Liquidus is defined as the curve above which the mixture exists in pure liquid forms below which the solution starts crystallizing to form solid. The point below which the 1st liquid→solid transition takes place for particular composition is called liquidus.

2. Draw a typical phase diagram for two soluble materials. Label the solidus, liquidus, tie line, and melting points of A and B. Also, mark the different phases.
1. Name any two types of coated steel (as discussed in class).
   i. Epoxy-coated steel
   ii. Galvanized steel (or zinc-oxide coated)

2. The **yield** strength of Fe 550D steel is 550 MPa.

3. Shown below is the cross-section of TMT/QST steel. Label the phase of the core region.

![Diagram of TMT/QST steel cross-section]

4. The density of steel is about **2.7 times** that of aluminum.

5. The ore used for steel production is **Haematite**.

6. Typically, **dilute weak sulphuric** acid is used as electrolyte during aluminium anodizing.

7. The four compounds of cement clinker are $\text{C}_3\text{S}$, $\text{C}_3\text{A}$, $\text{C}_2\text{S}$, and $\text{C}_4\text{AF}$.

8. Adding more water can **decrease** the strength of hydrated cement concrete.

9. What are the two major products of cement hydration?
   i. CH (calcium hydroxide)
   ii. CSH (calcium silicate hydrate)

10. What is the main reason for the grey color of cement?
    - The presence of **Fe$_2$O$_3$$ \text{(iron oxide)}$$\text{Fe}_2\text{O}_3$$ in cement give it the grey color & its production is by burning coal as fuel.
1. What are the 3 components of bituminous materials.
   i. Asphaltene
   ii. Resin
   iii. Oils

2. According to Indian standards, what is the compressive strength requirement for burnt clay bricks?
   \[ 10 - 15 \text{ MPa} \] is the compressive strength for burnt clay bricks.
   Structural Facing clay bricks

3. Draw a neat sketch showing the crack initiation in asphalt pavements due to fatigue loading.

   ![Crack Initiation Sketch]