USN :

CMR Institute of Technology, Bangalore
DEPARTMENT OF CIVIL ENGINEERING
II - INTERNAL ASSESSMENT

Semester: 4-CBCS 2018
Subject: CONCRETE TECHNOLOGY (18CV44)
Faculty: Mr Ruchir

Date: 23 Jun 2021
Time: 01:00 PM - 02:30 PM
Max Marks: 50

Answer any 5 question(s)

Q.No		Marks	CO	PO	BT/CL
1	Define workability. Explain factors the factors influencing the workability of concrete.	10	CO2	PO1	L2
2	What is the importance of curing of concrete?Briefly discuss any two methods.	10	CO2	PO1	L2
3	Define the Durability of concrete.Explain the factors influencing the durability of concrete.	10	CO3	PO2	L2
4	List the different Insitu concrete testing method.Explain principle, Limitation of Rebound hammer test	10	CO3	PO1	L2
5	Write a note on Creep and Shrinkage of concrete	10	CO2	PO1	L2
6	Write a note on Seggregation and Bleeding of concrete.	10	CO2	PO1	L2

IAT 2

Concrete Technology(18CV44)

1	⦿ Workability in simple terms can be defined as “the ease with which the concrete can be mixed, transported, placed and compacted”. **Factors affecting the workability of Concrete** ⦿ Cement Content ratio ⦿ Water/ Cement Ratio or Water Content in Concrete. ⦿ Size of Aggregates. ⦿ Shape of aggregates ⦿ Grading of aggregates ⦿ The surface texture of aggregates ⦿ Use of Admixture in Concrete <u>Cement Content ratio</u> • Additional Cement Content in Concrete affects the workability of concrete in good measures. • More cement content in concrete provides flexibility and smooth concrete surface and it thoroughly fills voids between aggregates. • This also helps to reduce friction between aggregates and smooth movements between aggregates while mixing, placing and compacting of concrete. • If the fineness of the cement increases, then it will require more water for smooth workability comparatively with less fine cement. ⦿ <u>Water/ Cement Ratio or Water Content in Concrete.</u> • The water-cement ratio of 0.45 to 0.6 is used for better workability without even using any additional Admixture to Concrete. • Higher the water-cement ratio, the higher the water content per volume of concrete and Concrete will be more workable. • The higher water-cement ratio is normally used for manual concrete mixing work for better workability. ⦿ <u>Size of Aggregates</u>. • A surface area of aggregates relies upon the size of aggregates. For the unit volume of aggregates with large size, the surface area of less contrasted with the same volume of aggregates with Small size. • When the surface area of aggregates increases, then the requirement of the cement content also increases to cover the entire surface of aggregates with cement paste. • Moreover, this requires the use of more water to lubricate each aggregate. • However, the lower size of aggregates with the same water content is less workable than the large size of aggregates. ⦿ <u>Grading of aggregates</u> • Well-Graded aggregates have a major effect on the workability of concrete. Well-graded aggregates help in reducing the voids in the given volume of aggregates. • If the grading of aggregates is good then there will be less chance of voids in between. Hence, it improves the workability of concrete. ⦿ <u>Surface texture of aggregates</u> ⦿ A surface texture, such as rough surface and smooth surface of aggregates affects the workability of concrete in the same way as the shape of aggregates. ⦿ Rough textured surface area aggregates have a more surface area than the aggregates	

	of the same volume with a smooth textured surface. Though, Concrete with smooth surface texture is more workable than rough-textured surface aggregates. ⦿	
2	Curing of Concrete is a method by which the concrete is protected against loss of moisture required for hydration and kept within the recommended temperature range. Curing will increase the strength and decrease the permeability of hardened concrete. Curing is also helps in mitigating thermal and plastic cracks, which can severely impact durability of structures. Water curing Water curing prevents the water loss from the concrete surface by uninterrupted wetting of the exposed surface of concrete. It's done by spraying or sprinkling water or curing agents over the concrete surface to ensure that the concrete surface is continuously moist. Moisture from the body of concrete is retained from evaporating and contributes to the strength-gain of concrete. Water curing methods are • Ponding • Sprinkling, fogging & mist curing • Wet coverings	
3	• The durability of cement concrete is defined as its ability to resist weathering action, chemical attack, abrasion, or any other process of deterioration. Durable concrete will retain its original form, quality, and serviceability when exposed to its environment. • **Factors affecting durability of concrete** • **Cement content** • Mix must be designed to ensure cohesion and prevent segregation and bleeding. • If cement is reduced, then at fixed w/c ratio the workability will be reduced leading to inadequate compaction. • However, if water is added to improve workability, water / cement ratio increases and resulting in highly permeable material. • **Compaction** • The concrete as a whole contain voids can be caused by inadequate compaction. • Usually it is being governed by the compaction equipments used, type of formworks, and density of the steelwork • **Curing** • It is very important to permit proper strength development aid moisture retention and to ensure hydration process occur completely. • **Cover** • Thickness of concrete cover must follow the limits set in codes. • **Permeability** • It is considered the most important factor for durability. It can be noticed that higher permeability is usually caused by higher porosity. • Therefore, a proper curing, sufficient cement, proper compaction and suitable concrete cover could provide a low permeability concrete	

	The factors influencing durability include: a) the environment; b) the cover to embedded steel; c) the type and quality of constituent materials; d) the cement content and water/cement ratio of the concrete; e) workmanship, to obtain full compaction and efficient curing; and f) the shape and size of the member. •	

4	Different Non destructive test are • Rebound Hammer (Hardness Test) • Ultrasonic Pulse Velocity Test • Pull Out Test • Penetration Resistance • Other non-destructive tests Rebound Hammer test is a Non-destructive testing method of concrete which provide a convenient and rapid indication of the compressive strength of the concrete. Objective of Non destructive test are • To determine the compressive strength of the concrete by relating the rebound index and the compressive strength. • To assess the uniformity of the concrete. • To assess the quality of the concrete based on the standard specifications. • To relate one concrete element with other in terms of quality. • <u>Procedure</u> • The concrete surface should be smooth, clean and dry. • And loose particles should be rubbed off from the concrete surface with a grinding wheel or stone, before hammer testing. • Rebound hammer test should not be conducted on rough surfaces as a result of incomplete compaction, loss of grout, spalled or tooled concrete surface. • The point of impact of rebound hammer on concrete surface should be at least 20mm away from edge or shape discontinuity. • Six readings of rebound number is taken at each point of testing and an average of value of the readings is taken as rebound index for the corresponding point of observation on concrete surface.	
5	• **Concrete creep is defined as**: deformation of structure under sustained load. • Long term pressure or stress on concrete can make it change shape.	

	• This deformation usually occurs in the direction the force is being applied. Factors influencing Creep are: • **Influence of Aggregate** • **Influence of Mix Proportions:** • **Influence of Age** • Concrete Shrinkage is the change in length per unit length and is, therefore, a dimensional number expressed as percent. • Shrinkage is time-dependent and its value includes plastic shrinkage, autogenous shrinkage, drying shrinkage, and carbonation shrinkage usually quantified in terms of micro strain which is equal to $1x10^{-6}$ in/in or $1x10^{-6}$ m/m. • **Plastic Shrinkage** • **Drying Shrinkage** • **Autogeneous Shrinkage** • **Carbonation Shrinkage**	
6	**Segregation and Bleeding of concrete** • Segregation is the "**Separation of constituent materials in concrete.**" In concrete technology, segregation is of three types:- • Separation of Coarse aggregate from the concrete mixture, • Separation of Cement pastes from the concrete during its plastic stage. • Separation of water from the concrete mix (Bleeding in concrete) **factors causing segregation in concrete:-** ▪ Transporting concrete mixes for long distances. ▪ Poorly proportioned mix, where sufficient matrix is not there to bind the aggregates. ▪ Dropping concrete from more than 1m. ▪ Vibrating concrete for a long time. **Bleeding in concrete** Bleeding is a form of segregation in which water present in the concrete mix is pushed upwards due to the settlement of cement and aggregate. The specific gravity of water is low, due to this water tends to move upwards. Bleeding ordinarily occurs in the wet mix of concrete. The Prime factor for bleeding in concrete is the high dosage of Water cement ratio. Higher water-cement ratio weakens concrete and leads to excessive bleeding. The bleeding in concrete is not harmful if the rate of evaporation of water is equal to the rate of bleeding. Normal bleeding is quite good, and it enhances the workability of concrete. When the concrete is fully plastic, bleeding may not cause much harm. However, concrete is still in the plastic stage later it is subsidized and compacted.	