313(S)

December 2016

CONCRETE TECHNOLOGY

Time Allowed: 3 Hours *Full Marks: 70*

Answer to Question No.1 is compulsory and to be answered first.
This answer is to be made in separate loose script(s) provided for the purpose.
Maximum time allowed is 45 minutes, after which the loose answer scripts will be collected and fresh answer scripts for answering the remaining part of the question will be provided.
On early submission of answer scripts of Question No.1, a student will get the remaining script earlier.

Answer <u>any five</u> questions from the rest.

1. Answer <u>any twenty</u> questions: 20x1

i) When high early strength is required _____ cement is used – (a) Rapid hardening cement (b) Quick setting cement (c) Low heat cement (d) Ordinary Portland cement.

ii) Total Heat of hydration of cement is independent of – (a) Ambient temperature (b) Composition of cement (c) Fineness of cement (d) All of the above.

iii) Flakiness index is determined by – (a) Length Gauge (b) Thickness Gauge (c) Dimension Gauge.

iv) Finer the cement – (a) Higher is the rate of hydration (b) More is the surface area (c) Lesser the amount of water required (d) All of the above.

v) For soundness test which apparatus is used – (a) Vicat apparatus (b) Le-chatelier apparatus (c) Air permeability apparatus.

vi) If sea water is used for preparing concrete – (a) Improves strength (b) Reduces strength (c) Gives a smooth surface.

vii) Early setting of concrete is brought out by reducing – (a) $Cacl_2$ (b) Cao (c) Gypsum (d) Al_2o_3.

viii) The Cements used for construction of road pavement – (a) Rapid Hardening cement (b) Ordinary Portland cement (c) Low heat cement (d) All of the above.

ix) Elongation index is determined by – (a) Length Gauge (b) Thickness Gauge (c) Dimension Gauge.

x) Low heat Cement is used for – (a) Repairs of road (b) Under water construction (c) Thin Structure (d) Construction of dam.

xi) Admixtures can be used to – (a) Improve permeability (b) Inhibit the corrosion of concrete (c) Produce non-skid surface (d) Any of the above.

xii) Following compounds can be used as accelerators except – (a) $CaCl_2$ (b) $CaSO_4$ (c) NaCl (d) Na_2SO_4.

xiii) Air entraining agents – (a) Are used for entraining air in concrete (b) Increase durability of concrete to frost action, (c) Contain wood resins, fats and lignosulfonates (d) All of the above.

xiv) Fly ash may be used as – (a) A part replacement of cement of cement (b) A part replacement of cement of aggregates (c) An admixture (d) All of the above.

xv) An accelerator shortens all of the following except – (a) Setting time (b) Period of curing (c) Period of removal of formwork (d) Strength of Concrete.

xvi) Segregation in concrete results in – (a) Porous layers (b) Honeycombing (c) Surface scaling (d) All of the above.

xvii) Addition of air-entraining agents to concrete increases all of the following except – (a) Workability (b) Strength of concrete (c) Durability (d) Impermeability.

xviii) The separation of coarse aggregate from mortar during transportation of concrete is termed as – (a) Bleeding (b) Creeping (c) Segregation (d) Flow of concrete.

xix) The workability of concretes can be improved by the addition of any of the following except – (a) Fly ash (b) Copper sulfate (c) Calcium chloride (d) Plasticizers.

xx) A retarder plasticizer reduces workability loss – (a) Due to slowing down the proem setting (b) Due to air-entrainment (c) Hydrophobic action (d) Through the process of flocculation.

xxi) If the slump of concrete mix is 75 mm, its workability is considered to be – (a) Very high (b) High (c) Medium (d) Very low.

xxii) The slump test of concrete is used to measure its – (a) Compaction under gravitational force (b) Mobility (c) Consistency (d) Homogeneity.

xxiii) The compacting factor test for fresh concrete – (a) Is adopted when nominal size of aggregate does not exceed 20 mm (b) Measures the relative effort required to change a mass of concrete from one definite shape to another (c) Measures the compaction obtained by a standard amount of work applied to a standard quantity of concrete (d) Gives an indication of the mobility of fresh concrete.

xxiv) Bleeding of concrete is said to occur when – (a) Finer particles settle down at the bottom (b) Coarser particles get separated (c) Cement paste rises to the surface of concrete (d) Finer particles collect in isolated pockets.

xxv) Workability of concrete is independent of – (a) Mix proportions (b) Water content (c) Size, shape and texture of aggregate (d) Environment conditions.

xxvi) Quality control means – (a) Extra cost (b) A rational use of the available resources (c) Adequate design to minimize cost (d) All of the above.

xxvij) The strength of the concrete is decreased by – (a) Vibration (b) Impact (c) Fatigue (d) All of these.

xxviii) The modulus of elasticity of concrete improves with – (a) Age (b) High water-cement ratio (c) Shorter curing periods (d) Better compaction.

2. a) Which compounds are present in Bouge's Compound? Give their equations.
   b) What are the advantages of quality control?
   c) Describe in brief the different types of cement. 2+3+3+2

3. a) How can we calculate the Initial Setting Time of the Cement?
   b) What is the final setting time of cement?
   c) Which factors Effecting in alkali Aggregate reaction?
   d) What is the difference between initial set and final set? 3+2+3+2

4. a) Write the advantages of Portland Pozzolona Cement.
   b) What is coloured Cement? Give example.
   c) Write down the chemical composition of cement.
   d) Explain: Hydration of cement. 3+2+3+2

5. a) What are the reactions of hydration of the main compounds in Portland cement?
   b) What are the minor compounds in Portland cement? What are their roles?

	c)	What is blended cement?	
	d)	Where Quick setting Cement is used?	3+4+2+1
6.	a)	Derived aggregates according to their – Size and Shape.	
	b)	For aggregate abrasion value which apparatus is used?	
	c)	Define initial and final setting time in terms of Vicat's apparatus. What is the practical utility of knowing the initial and final setting time of cement?	(2x2)+1+5
7.	a)	Explain the adverse effect of excessive use of admixture.	
	b)	Define flakiness and elongation index of aggregate.	
	c)	Explain the compacting factor test and slump test.	3+2+5
8.	a)	Describe the segregation, bleeding and laitance of concrete; explain the factors affecting them.	
	b)	What is gel- space ratio? How it it influence the strength of concrete?	(3+3)+(2+2)
9.	a)	What are the precautions of placing concrete?	
	b)	What do you mean by compaction? Name the different methods of compactions.	
	c)	What do you mean by hot weather concreting?	
	d)	Differentiate between RCC and prestressed concrete.	2+3+2+3
10.	a)	What do you mean by harshness and cohesiveness of fresh concrete mix?	
	b)	What are the main factors in designing concrete for durability?	
	c)	What is creep? Discuss its importance in concrete structures.	5+2+1+2