Model Answer: Winter-2019

Subject: Concrete Technology | **Sub. Code: 17504**

Important Instructions to Examiners:

1) The Answer should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more importance. (Not applicable for subject English and Communication Skills.)
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by the candidate and those in the model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's Answer and the model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.1	**(A) (a)**	**Answer any THREE of the following:** **State any four field tests on cement.**		**12**
	Ans.	**Field tests on cement:** 1) The colour of fresh cement should be greenish grey. 2) The hand in cement bag should give cool feeling. 3) A pinch of cement should give smooth feeling to fingers. 4) The handful cement should float on water for some time before its dipping. The sharp edged cake under water should remain sharp edged even after 24 houres. 5) The color of cement should not be changed after burning. 6) The cement should not contain visible lumps in it. 7) The cement roll should give shiny surface after cutting with knife.	**1 each (any four)**	**4**
	(b)	**State Bogue's compounds with their effect on properties of cement.**		
	Ans.	**Bogue's compound and their effect on cement properties:** 1) **Tri-calcium Silicate:** It gives early strength to cement by producing more heat of hydration. 2) **Di-calcium Silicate:** It gives ultimate strength to cement by generating comparatively lesser heat. 3) **Tri-Calcium aluminate:** It varies setting time of cement. 4) **Tri-Calcium Alumino-ferrite:** It is chemically inactive and does not contribute compressive strength and setting time of cement.	**1 each**	**4**

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answer</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>Q.1</td><td>(c)

Ans.</td><td>Compare the properties of rapid hardening cement and Low heat cement.

Comparison of Rapid hardening cement and Low heat cement:
<table>
<tr><th colspan="2">Rapid Hardening Cement (RHC)</th><th colspan="2">Low Heat Cement (LHC)</th></tr>
<tr><td>1</td><td>RHC hardens very rapidly as compared to LHC.</td><td>1</td><td>LHC hardens slowly than RHC.</td></tr>
<tr><td>2</td><td>Fineness = 5 % or 3250 cm^2/gm.</td><td>2</td><td>Fineness = 10 % or 3200 cm^2/gm.</td></tr>
<tr><td>3</td><td>Soundness = Less than 10 mm</td><td>3</td><td>Soundness = Less than 5 mm</td></tr>
<tr><td>4</td><td>Initial setting time = 30 minutes
Final setting time = 600 minutes</td><td>4</td><td>Initial setting time = 30 minutes
Final setting time = 600 minutes</td></tr>
<tr><td>5</td><td>Compressive strength
3 days = 160 MPa</td><td>5</td><td>Compressive strength
3 days = 100 MPa.</td></tr>
</table></td><td>1 each (any four)</td><td>4</td></tr>
<tr><td></td><td>(d)

Ans.</td><td>Enlist any four physical properties of OPC. State how fineness of cement is determined by sieving method.

Physical properties of OPC:
1) Fineness
2) Standard or Normal Consistency
3) Initial and Final Setting Time
4) Soundness
5) Compressive Strength

Determination of fineness of cement by IS sieving method:
1) Take 100 gm. of cement sample as w_1 and put it on 90 micron IS sieve.
2) Break any visible lumps if any using fingers without rubbing it on sieve. Keep lid and pan at top and bottom respectively.
3) Shake this assembly for 10-15 min manually by giving wrist motion so that the cement sample will sieved completely.
4) Now, take the weight of cement sample retained on 90 micron sieve as W_2 gm.
5) Finally, calculate % fineness of cement by using by using formula % fineness = W_2/ W_1 x 100.
6) Repeat above steps two more times to calculate average % fineness of given cement sample.</td><td>½ each (any four)

2</td><td>4</td></tr>
</table>

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.1	**(B)**	**Answer any ONE of the following:**		**6**
	(a)	**Define bulking of sand and state effect of bulking of sand on concrete.**		
	Ans.	**Bulking of sand:** It is defined as increase in volume of given sand due to surface moisture present on surface of particles, called as bulking of sand. **Effect of bulking of sand on concrete:** 1) Due to bulking of sand, the actual quantity of sand taken i.e. dry volume will be less; hence required mix proportions become erroneous. 2) When bulking of sand takes place, wet or bulked sand used in concrete gives increases w/c ratio of particular concrete. 3) Due to increase in water content of concrete, this excessive water results in segregation and bleeding effect in fresh concrete. 4) Finally, concrete shows dusty surface and porous nature. Concrete reduces strength and durability in its hardened stage.	**2** **4**	**6**
	(b)	**State any four properties of coarse aggregate and state the procedure of determination of impact value of coarse aggregate.**		
	Ans.	**Properties of coarse aggregate:** 1) Size 2) Source 3) Shape - Flakiness and Elongation Index 4) Surface texture 5) Water absorption 6) Specific gravity 7) Bulk density 8) Fineness Modulus 9) Cleanliness 10) Alkali-Aggregate reaction 11) Strength – Impact, Crushing, Abrasion **Procedure of determination of impact value of coarse aggregate:** 1) Take oven dried aggregate passing through 12.5 mm IS Sieve and retained on 10 mm IS sieve. Fill this aggregate in impact mould in 3 layers. Compact each layer 25 times using standard tamping rod. 2) Calculate the weight of aggregate filled by subtracting empty weight of mould as W_1 gm. Put the mould under aggregate impact testing machine and give 15 successive blows with a gap not more than 1 sec. by lifting handle of it; so that aggregate gets crushed. 3) Take out sample from mould and sieve it through 2.36 mm IS sieve. Take weight of aggregate fraction passing through 2.36 mm IS sieve as W_2 gm. 4) Calculate % aggregate impact value of given coarse aggregate as (W_2/W_1) X 100.	**½ each (any four)** **4**	**6**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2		**Answer any FOUR of the following:**		16
	(a)	**State any four factors affecting the workability of concrete.**		
	Ans.	**Factors affecting the workability of concrete:** 1) Water-cement ratio of concrete 2) Size of aggregate 3) Shape of aggregate 4) Surface Texture of aggregate 5) Method of mixing of concrete 6) Grading of aggregate 7) Water absorption of aggregate 8) Use of admixtures 9) Temperature during concreting	**1 each (any four)**	**4**
	(b)	**State four objectives of concrete mix design.**		
	Ans.	**Objectives of concrete mix design:** 1) To achieve a specified compressive strength of concrete. 2) To reduce wastage of concrete by correct proportioning. 3) To achieve economy by selecting appropriate concrete ingredients. 4) To maintain workability of concrete mix throughout work. 5) To obtain maximum possible yield per bag of cement.	**1 each (any four)**	**4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	(c)	**Giving diagram, state step by step procedure of slump cone test.**		
	Ans.	**Procedure of slump cone test:** 1) Clean the mould from inside and apply oil to it. 2) Place the mould on smooth horizontal, rigid and non-absorbent surface or the center of metallic tray. 3) Fill the mould with the concrete to be tested in four layers, tamping each layer 25 times with the tamping rod, taking care that the strokes are evenly distributed over the c/s. 4) Remove the mould by one smooth continuous vertical motion. 5) The concrete subsides and this subsidence is called "slump." Measure the slump in mm by using a metric scale from top of cone. 6) Based on measured slump, the degree of workability is designated as follows.	**2**	

Sr. No.	Slump (mm)	Degree of workability
1	0 – 25	Very low
2	25 - 50	Low
3	50 – 100	Medium
4	100 - 175	High

1

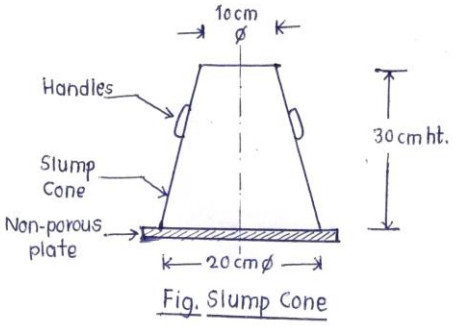


Fig. Slump Cone

1 | **4**

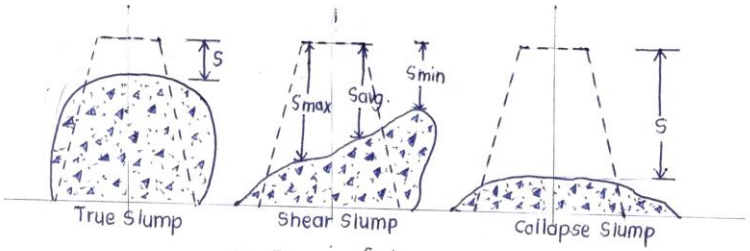


Fig. Types of slump.

Figure: Slump Cone Test

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.2	(d)	**Define segregation and bleeding of concrete.**		
	Ans.	**Segregation of concrete:** It is the separation of ingredients of concrete from each other while placing, called as segregation.	2	
		Bleeding of concrete: It is the removal or separation of water from rest of concrete mass during compaction, called as bleeding.	2	4
	(e)	**State necessity of supervision for concreting operations. (Any Four)**		
	Ans.	**Necessity of supervision for concreting operations:** 1) Supervision is necessary to complete all concreting operations in standard manner. 2) It is necessary to avoid any type of delay in concrete work. 3) It is also beneficial to reduce wastage of concrete during concreting. 4) It is required to get overall quality in concrete work at site. 5) Supervision becomes essential in maintaining smooth flow of concreting operations at each stage of project. 6) It found very effective in controlling bad workmanship.	1 each (any four)	4
	(f)	**State the importance of NDT of concrete and explain rebound hammer test.**		
	Ans.	**Importance of NDT of concrete:** 1) The strength can be tested without physical breaking of concrete; hence it is safe. 2) It can give internal flaws, cavities and homogeneity details of concrete within short period. 3) It avoids wastage of concrete, hence becomes economical up to certain extent. 4) It is applicable in any type and position of concrete members shows wide applicability. 5) Its results are simple and easy to interpret.	2	
		Rebound hammer test: 1) It consists of spring control hammer that slides on a plunger within a tubular housing. 2) When the plunger is pressed against the surface of concrete, the mass is rebound from the plunger. 3) The hammer impacts against the concrete and the spring control mass rebound, taking the rider along with the guide scale. 4) By pushing a button the rider can be held in position to allow the reading to be taken. The distance travelled by the mass is called rebound hammer. 5) The test can be conducted horizontally, vertically, upwards or downward or at any intermediate angle.	2	4

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.3		**Answer any FOUR of the following:**		16
	(a)	**State factors affecting workability of concrete (any Four) and explain any one.**		
	Ans.	**Factors affecting workability of concrete:** **1)** Water-cement ratio of concrete **2)** Size of aggregate **3)** Shape of aggregate **4)** Surface Texture of aggregate **5)** Method of mixing of concrete **6)** Grading of aggregate **7)** Water absorption of aggregate **8)** Use of admixtures in concrete **9)** Temperature during concreting	½ each (any four)	
		1. Water-cement ratio of concrete: When w/c ratio is less, the water content in the concrete will be less. It results in harshness in concrete which reduces workability of concrete. But when w/c ratio is more, it results segregation and bleeding. It results in reduction of strength and durability of concrete. Therefore w/c ratio should be optimum, taken from IS:456-2000. *(**Note:** The explanation of any one of the factor should be considered.)*	**2**	**4**
	(b)	**What is meant by grading of aggregate and define well graded, uniformly graded and gap graded aggregate?**		
	Ans.	**1) Grading of aggregate:** It is the analysis of size of aggregate particles available in given sample by sieving method; called as grading of aggregate. **2) Well graded:** The aggregate sample which contains particles of all sizes (i.e. finer to coarser) in it, such sample is said to be well graded aggregate. **3) Uniformly graded:** The aggregate which contains particles of specifically same or uniform size in it, such soil is considered as uniformly graded aggregate. **4) Gap graded aggregate:** It is the aggregate in which particles of any specific sizes are available and other sizes are totally absent, such sample be termed as gap graded aggregate.	**1 each**	**4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.3	(c)	**Classify the aggregate w.r.t. size & shape.**		
	Ans.	**Classification of aggregate w.r.t size:** 1) **Fine Aggregate:** The aggregate having size less than 4.75 mm is called as fine aggregate. 2) **Coarse Aggregate:** The aggregate having size more than 4.75 mm is called as coarse aggregate. **Classification of aggregate w.r.t shape:** 1) **Rounded Aggregate:** The shape of aggregate particles is almost circular with even smooth surface. 2) **Irregular or partly rounded Aggregate:** The shape of aggregate particles is partly rounded with uneven surface. 3) **Angular Aggregate:** The shape of aggregate fraction is triangular with rough surface. 4) **Flaky Aggregate:** The shape of aggregate is showing less thickness than length and breadth of aggregate particle. 5) **Elongated Aggregate:** The shape of aggregate is having more length than breadth and thickness.	**1 each** **½ each (any four)**	**4**
	(d)	**Determine fineness modulus of a sample of fine aggregate for the following observations. Total sample 1000 gms.**		

Sieve size	Wt. retained on Sieve gms
4.75 mm	14
2.36 mm	128
1.18 mm	266
600 µ	285
300 µ	154
150 µ	84
75 µ	34
Pan	35

Ans.

Sieve size	Weight Retained (gm)	Cumulative weight Retained (gm)	% Cumulative weight Retained (%)
4.75mm	14	14	1.4
2.36mm	128	142	14.2
1.18mm	266	408	40.8
600 µm	285	693	69.3
300 µm	154	847	84.7
150 µm	84	931	93.1
75 µm	34	965	-
Pan	35	1000	-
∑ % cumulative wt. retained upto 150µ IS sieve			**303.5**

2

F. M.= ∑ % cumulative wt. retained upto 150µ IS sieve / 100 — **1**
F.M. = 303.5/100
F.M. = 3.035 — **1** — **4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.3	(e)	**Define water cement ratio and state Duff-Abraham's law.**		
	Ans.	**Water cement ratio:** It is the ratio of weight of water to weight of cement taken in the particular mix proportion, called as w/c ratio.	2	
		Duff-Abraham's law: For workable concrete, the compressive strength of concrete depends on only on its water-cement ratio.	2	4
	(f)	**State factors affecting compressive strength of concrete (Any Four) and explain any one.**		
	Ans.	**Factors affecting compressive strength of concrete:** 1. **Type and quality of materials used:** If type and quality of materials used for concrete i.e. cement, sand, aggregate and water is not as per IS recommendations, then the properties of hardened concrete like strength, durability will affect drastically. Reactive aggregates reduce fire resistance and acidic/alkaline water gives cracks in concrete. Lesser grade of cement reduces compressive strength and durability of hardened concrete. 2. **Mix proportion of materials:** The badly mix proportion of good quality materials will result in reduced segregation and bleeding, which finally shows reduced workability and compressive strength of concrete. 3. **Methods of concreting operations:** If the concreting operations like batching, mixing, transportation are not completed in standard manner, then one cannot ensure sufficient strength and durability of concrete in hardened stage. Also lesser compaction results in honeycombing, which shows lack of impermeabilty in concrete. 4. **Workmanship:** If the supervisors, labours, masons etc. are not working properly, then the bad workmanship result in various defects in hardened concrete in terms of reduced compressive strength. 5. **Weather conditions:** The atmospheric variation also affects the properties of hardened concrete. The high temperature results in expansion cracks and reduced temperature gives rise to shrinkage cracks. Alternate drying and wetting of concrete in monsoon season may shows creep in concrete. The sudden change in weather conditions reduces compressive strength of hardened concrete.	**1 each (any four)**	**4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	(A)	**Answer any THREE of the following:**		12
	(a)	**State advantages and limitations of volume and weight batching.**		
	Ans.	**Advantages of volume batching:** 1) It gives quick measurement of materials for urgent work. 2) It can be done by locally available gauge boxes, farma etc. which becomes less expensive. 3) Unskilled labours can measure the materials using volume batching.	**1**	
		Limitations of volume batching: 1) Volume batching is approximate; as volume varies due to compaction. 2) It is limited to use for only small and less important constructions. 3) It is not suitable for very important RCC work. 4) There are more chances of wastage during volume batching.	**1**	
		Advantages of weight batching: 1) Weigh batching is more accurate, as weight remains constant everywhere. 2) It is suitable for important constructions like high rise building, mass concreting. 3) Wastage of materials remains less due to appropriate handling of materials.	**1**	
		Limitations of weight batching: 1) Weigh batching requires time to measure the required materials as compared to volume batching. 2) It is suitable for important constructions like high rise building, mass concreting. 3) It requires skilled personnel for accurate measurement.	**1**	**4**

Q.4 (b) State any four differences between steel formwork and timber formwork. — **Marks: 1 each (any four)** — **Total Marks: 4**

Ans. Difference between Steel formwork and Timber formwork:

	Steel formwork		Timber formwork
1	The formwork is in the form of steel plates, girders, props, etc.	1	This formwork includes plywood, timber battens, ballies, supports, wedges.
2	It is difficult to handle due to heavy weight.	2	It is light in weight, hence easy to handle.
3	It requires high initial cost.	3	It requires low initial cost.
4	It is more durable and hence can be repeatedly useful.	4	It is less durable, hence limited use.
5	It is economical for large projects.	5	It is economical for small scale works and unsuitable for mega projects.
6	It gives smooth finish.	6	It gives comparatively less smooth finish.
7	It is strong enough to resist load of concrete.	7	It has less strength as compared to steel formwork.
8	It is useful for casting of slabs, pavement, etc.	8	It is widely useful in casting of beam, column, wall, etc.

(c) Why curing of concrete is essential? & name any four methods of curing. — **Marks: 2** — **Total Marks: 4**

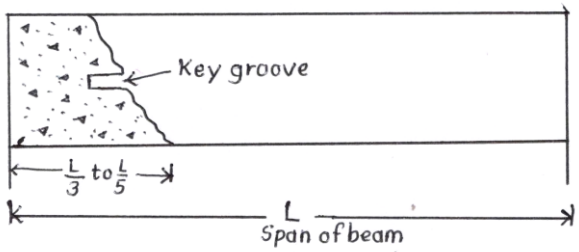
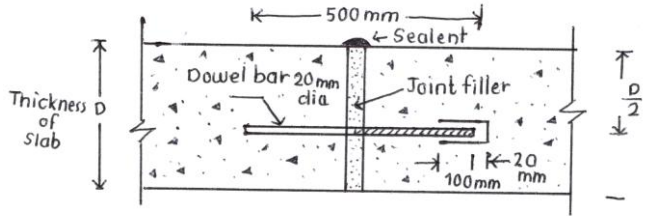
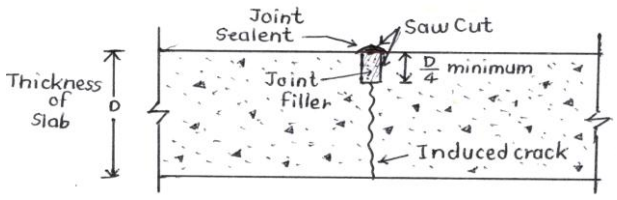
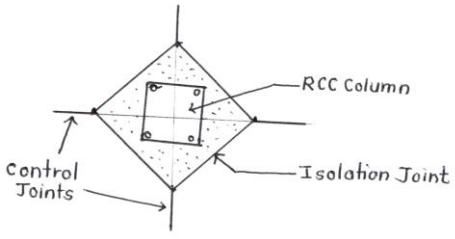
Ans.

Necessity of curing:

1) Curing is essential to maintain sufficient moisture in concrete for completing hydration.
2) It is necessary to maintain uniform temperature of concrete i.e. above freezing point.
3) It is useful to avoid chances of formation of shrinkage cracks and to attain uniform finishing.
4) It helps to increase impermeability and durability of concrete by achieving characteristic compressive strength.

Methods of curing: — **Marks: ½ each**

1) Water curing
   a. Immersion
   b. Ponding method
   c. Spraying or fogging
   d. Wet covering.
2) Membrane curing
3) Application of heat
4) Miscellaneous methods

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	(d)	**State types of joints in concrete and draw neat sketch of any one joint.**		
	Ans.	**Types of joints in concrete:** 1) Construction joint 2) Expansion joint 3) Contraction joint 4) Isolation joint	2	
		 Construction Joint		
		 Expansion Joint	2 (any one)	4
		 Contraction Joint		
		 Isolation Joint		

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.4	(B)	**Answer any ONE of the following:**		6
	(a)	**Enlist stages in concreting operations and state two precautions to be taken to avoid wastage of materials.**		
	Ans.	**Stages in concreting operations:** 1) Batching 2) Mixing 3) Transportation 4) Placing 5) Compaction 6) Curing 7) Finishing	**4**	
		Precautions to be taken to avoid wastage of materials: 1) Proper proportioning of mix is to be done so as to avoid excess use of any constituent of concrete. 2) Weigh batching should be adopted as volume batching being not accurate due to improper consideration of water content and specific gravity of aggregate. 3) Concrete should be transported quickly before its setting. 4) Quantity of material should be accurately estimated. 5) Formwork should be checked. It should be strong enough to carry the weight of concrete without bulging.	**1 each (any two)**	**6**
	(b)	**State any six precautions to be taken during transportation of concrete.**		
	Ans.	**Precautions to be taken during transportation of concrete:** 1) Keep the least possible distance between mixing plant and construction site by establishing the mixing plant nearest to site as far as possible. 2) Avoid atmospheric interaction of concrete by covering it with polythene cover when it is transported through open trucks or dumpers. 3) During transportation, wastage of concrete should be avoided. 4) Select the higher w/c ratio for concrete mix for longer transportations. 5) Maintain humid (moist) conditions around concrete (i.e. in case of RMC vehicles). 6) Use retarding admixtures in concrete to avoid early hardening of concrete.	**1 each (any six)**	**6**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.5		**Answer any FOUR of the following:**		16
	(a)	**State four purposes of using admixtures in concrete.**		
	Ans.	**Purposes of using admixtures in concrete:** 1) To modify the properties of fresh concrete as per site requirement so that to facilitate the actual working conditions. 2) To improve workability of concrete so as to avoid any wastage during handling. 3) To avoid segregation and bleeding problems occurring in non-homogeneous mix. 4) To increase or decrease the rate of setting or hardening of concrete. 5) To decrease the rate of setting or hardening of concrete in extreme weather conditions. 6) To reduce heat of hydration and related formation of cracks. 7) To reduce excessive water in concrete mix so that optimum workability can be maintained. 8) To increase flow ability of concrete mix. 9) To increase in bonding between steel reinforcement and concrete mass. 10) To increase strength and durability of concrete in its hardened state. 11) To improve finishing of concrete by reducing voids and hence making dense concrete. 12) To join old and new concrete at construction joints.	**1 each (any four)**	**4**
	(b)	**State the effect of hot weather on concrete.**		
	Ans.	**Effect of hot weather on concrete:** 1) Due to hot weather, concrete shows rapid rate of hardening, which results difficulty in transportation of concrete. 2) Water from concrete mix gets evaporated rapidly, which results on w/c ratio and less workability of concrete. 3) Water may get absorbed by formwork, aggregate or ground due to excessive heat. 4) More shrinkage cracks get developed on concrete surface due to incomplete hydration with less water in concrete. Hence, early finishing becomes more essential. 5) Continuous curing is required to keep humidity and to avoid further development of cracks. 6) Air entrained in concrete may get expelled due to temperature, hence workability may reduce additionally.	**1 each (any four)**	**4**

<table>
<tr><th>Que. No.</th><th>Sub. Que.</th><th>Model Answer</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td>Q.5</td><td>(c)

Ans.</td><td>State any four chemical admixtures used in concrete and situations where it is used.

Chemical admixtures used in concrete stating practical situations:
1) Accelerating admixture: To increase the rate of setting of the concrete and for early removal of formwork in cold climate.
2) Retarding admixtures: To reduce the rate of hardening of the concrete in hot weather.
3) Water reducing admixtures: To maintain appropriate water in concrete for deep beams, thin walls and tremie concrete.
4) Air entraining admixtures: To modify the properties of concrete in plastic stage of concrete like workability, segregation and of hardened concrete like impermeability and resistance to frost action.
5) Super plasticizers: To reduce water upto 30% without reducing workability.
6) Pozzolanic admixture: To reduce heat of hydration and alkali-aggregate reaction.
7) Grouting agents: To increase pumpability and rate of setting of grouting cement.
8) Bonding admixtures: To join old and new concrete at construction joints.</td><td>1 each (any four)</td><td>12

4</td></tr>
<tr><td></td><td>(d)

Ans.</td><td>Compare accelerating admixture with retarding admixture.

Comparison between accelerating admixture and retarding admixture:
<table>
<tr><th colspan="2">Accelerating admixture</th><th colspan="2">Retarding admixture</th></tr>
<tr><td>1</td><td>It is useful to increase rate of setting of concrete.</td><td>1</td><td>It is useful to decrease rate of hardening of concrete.</td></tr>
<tr><td>2</td><td>It is widely used in cold weather concreting.</td><td>2</td><td>It is mostly used in hot weather concreting.</td></tr>
<tr><td>3</td><td>It contains more amounts of C_2S and C_3S compounds in it.</td><td>3</td><td>It includes more percentage of C_3A and C_4AF in it.</td></tr>
<tr><td>4</td><td>These admixtures reduce water from concrete by generating heat of hydration.</td><td>4</td><td>These admixtures restrict water evaporation from concrete.</td></tr>
<tr><td>5</td><td>It facilitates quick removal of formwork and increases speed of construction.</td><td>5</td><td>It is beneficial in safe, easy transportation and minimizing crack formation.</td></tr>
</table></td><td>1 each (any four)</td><td>4</td></tr>
</table>

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.5	(e)	**What is R.M.C.? State any two advantages and two disadvantages of RMC.**		
	Ans.	**Ready Mix Concrete (RMC):** The concrete which is readily mixed at separate mixing plant and then borrowed to construction site is known as Ready Mix Concrete. There is no need to mix the concrete on site. The mix proportion of concrete ingredients are standardized and mixed by computer inputs.	**2**	
		Advantages of Ready Mix Concrete (RMC); 1. Bulk amount of concrete can be produced at a time to avoid delay in construction. 2. Wastage of materials can be avoided due to mechanized operations at plants. 3. RMC give higher quality mix than ordinary concrete due to computerized working of plant. 4. It can be easily transported longer distance without hardening, hence suitable even in congested urban area.	**½ each (any two)**	**4**
		Disadvantages of Ready Mix Concrete (RMC); 1. RMC is expensive than ordinary concrete, hence suitable for large projects only. 2. Continuous and bulk supply of materials is necessary for smooth working of RMC plant. 3. It may get affected on its quality due to improper functioning of plant elements. 4. It requires skilled labours for operation and it has low profit margin.	**½ each (any two)**	
	(f)	**State any four properties of Fiber Reinforced Concrete.**		
	Ans.	**Properties of Fiber Reinforced Concrete:** 1) Very high tensile strength 2) Crack arrester 3) Uniform load distribution through matrix 4) More fire resistance 5) High shear and torsional strength 6) Resistance to freezing and thawing damage 7) More resistance to shocks and vibration 8) Less self-weight 9) Smooth finishing	**1 each (any four)**	**4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6		**Answer any FOUR of the following:**		**16**
	(a)	**State step by step procedure of testing of concrete for compressive strength.**		
	Ans.	**Procedure of testing of compressive strength of concrete:** 1. Take three cube moulds of 15 cm side and apply oil to its inner surface. Prepare the concrete mixture of required grade. 2. Fill it in each mould in three layers. Compact each layer evenly spaced 25 times strokes with 16 mm. diameter standard tamping rod. Compaction of concrete is done by using table vibrator to remove air completely from concrete. 3. Keep all the moulds at room temperature for 24 hrs for initial hardening and at relative humidity 90%. 4. Remove cube moulds and keep concrete cubes under fresh water for curing for 7, 14, 21, 28 days. 5. Remove cube from water after curing period and keep it under compression testing machine (CTM) for testing. 6. Apply compressive load at a rate of 4 tones / min for 10 minutes or till failure of cube. Note down the failure load in kN shown by red pointer of dial gauge. 7. Calculate compressive strength of each cube. Take failure load in N and cross sectional area of cube in mm^2. 8. Calculate average compressive strength of three test cubes in N/mm^2.	**4**	**4**
	(b)	**State the precautions to be taken for keeping concrete mixer in good condition.**		
	Ans.	**Precautions to be taken for keeping concrete mixer in good condition:** 1) Concrete mixer should not be overloaded. The load should be as per capacity of mixer, otherwise it affects on usability. 2) While unloading through non-tilting type mixer, proper technique should be followed, otherwise it may lead to breaking the drum and other parts. 3) It should be cleaned immediately after its use either by hard brushing or washing. 4) The periodic maintenance of concrete mixer should be done to ensure its serviceability. 5) Skilled labours (Operator) should handle the mixer during its use and additionally, supervision is also required for correct handling of mixer. 6) The mixer should be kept under shade when not in use to reduce environmental impact on it in terms of corrosion, spalling of paint etc. 7) Mixer should be rotated with specified revolutions per minute. More rotations may cause non-functionality of mixer.	**1 each (any four)**	**4**

Que. No.	Sub. Que.	Model Answer	Marks	Total Marks
Q.6	**(c)**	**State any four precautions to be taken while placing of concrete.**		
	Ans.	**Precautions to be taken while placing of concrete:** 1) While placing of concrete, the mixture should reach at all corners uniformly and not intensively at one place. 2) Placing thickness for mass concrete should be less than 30-45 cm and for RCC work should be less than 15-30 cm. 3) Before placing of concrete the formwork joints should be checked to avoid bleeding. 4) Concrete mixture should not be dropped from the height more than 1 m. 5) Before placing of concrete, oiling to inner face of formwork should be done. 6) Flow of placing of concrete should be continuous and joints should be left at appropriate position.	**1 each (any four)**	**4**
	(d)	**State any four properties of high performance concrete.**		
	Ans.	**Properties of High performance concrete:** 1) Higher workability 2) Higher strength 3) High modulus of elasticity 4) More density 5) More dimensional stability 6) Low permeability 7) High resistance to chemical attack	**1 each (any four)**	**4**
	(e)	**State precautions to be taken while concreting in cold weather.**		
	Ans.	**Precautions to be taken while concreting in cold weather:** 1) Concrete work should be done during day time or on sunny days. 2) Warm water should be added for mixing of ingredients of concrete. 3) Before placing of concrete, the formed ice, snow or frost should be removed from formwork. 4) The accelerating admixtures should be used to increase hardening of concrete. 5) A protective cover should be used over casted concrete to avoid cold winds and snow fall. 6) Steam curing should be preferred in place of ordinary water curing. 7) Aggregates (fine and coarse) should be heated before its use. 8) Rapid hardening or quick setting cement should be used for fast setting of concrete.	**1 each (any four)**	**4**