MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

(Autonomous)

(ISO/IEC-270001 – 2005 certified)

WINTER-14 EXAMINATION

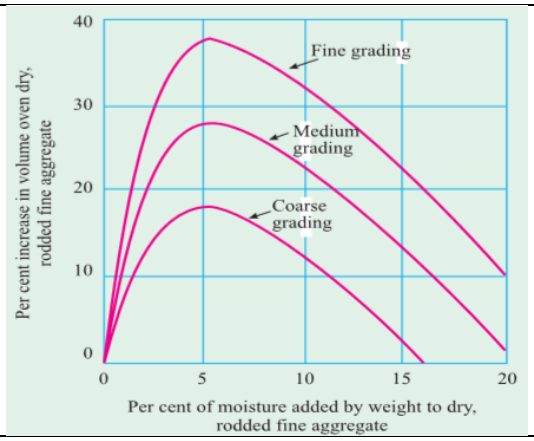
Subject code: 17504 **Model Answer**

Important Instructions to examiners:

1) The answer should be examined by keywords 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 error such as grammatical, spelling errors should not be given more importance.(Not applicable for subject English and communication skill).
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figure drawn by candidate and 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 the some cases, the assumed constants values may vary and there may be some difference in the candidates answer and model answer.
6) In case of some questions credit may be given by judgment on part of examiner of relevant answer based on candidates understanding.

Q.1 a) Attempt any three	**12**
i) Explain the process of hydration of cement	
1. Hydration of cement can be done in two ways : - a) The cement compounds dissolve to produce a supersaturated solution from which different hydrated products gets precipitated. b) The water attacks the cement compound in solid state converting the compound into the hydrates products starting with the surface and proceeding to the interior of the compound with time. **2.** The chemical reaction that takes place between cement and water is called as hydration of cement. **3.** The study and control of heat of hydration is important in construction of concrete dams and other mass concrete construction. **4.** The chemistry of concrete is the chemistry of reaction between cement and water on account of hydration certain products are formed and these products are important because they have cementing or adhesive value. **5.** Anhydrous cement compound when mixed with water reacts with each other to form hydrated compound of very low solubility.	2M ½ M each
ii) What are the special properties of low heat cement and white cement	
A) Special Properties of Low Heat Cement: - **1.** In this cement the proportion of C_2S is increased and C_3S and C_3A proportion is decreased. **2.** Low heat cement achieves strength at very slow rate but the ultimate strength of low heat is same as that of ordinary Portland cement. **3.** The 7 day strength of low heat cement is not less than 16Mpa. **4.** A Low heat Portland cement produces less heat or same heat at low rate during hydration process. **5.** The specific surface of low heat cement as found out by air permeability method is not less than 3200 sq.cm/gm. **Uses: -** **1.** Low heat Cement is used in Construction of Massive Dams. **2.** In Cold region low heat cement can be used. **B) Special Properties of White Cement** **1.** White cement can be used as a base for color cement. **2.** The whiteness of white cement should not be less than 70% as measured by ISI. **3.** The minimum compressive strength of white cement as per IS 8042:1989 is 29.7Mpa after 28 Days. **4.** The minimum degree of fineness of white cement as per Blain air permeability apparatus is 225m^2/Kg. **Uses: -** **1.** For manufacturing various colored cement white cement is used as a base. **2.** It is used in filling joint between tiles.	1M 1M 1M
iii) Explain the procedure to determine standard consistency	
The standard consistency of cement paste is defined as that consistency which will permit a Vicat plunger having 10mm diameter and 50mm in length to penetrate to a depth of 33mm to 35mm from top of the mould, the apparatus is called as vicats apparatus.	½ M

Procedure for Determination of Standard Consistency of Cement: 1. Take about 500gm of cement and prepared a paste with a weighted quantity of water (say 24%)by weight of cement for first trial. 2. The paste must be prepared in standard manner and should be filled in Vicat's mould within 3 to 5 minutes. 3. After completely filling the mould shake the mould and remove the air. 4. A standard plunger of 10mm diameter and 50mm in length is placed on top of the mould and is released quickly allowing it to sink by its own weight. 5. The depth of penetration of plunger should be noted. 6. Conduct 2nd trial by adding more percentage of water with higher water cement ratio such that the plunger penetrates through 33-35mm from top of the mould. 7. This particular percentage of water that allows the plunger to penetrate only at depth of 3-35mm from top is known as percentage of water required to produce a cement paste of standard consistency.	½ M each
iv) What is meaning of 33 grade, 43 grade and 53 grade cement? State where they are used.	
As per IS 4013-1988:- 1. **33 Grade Cement: -** If the 28 days strength is not less than 33N/mm^2 when tested then it is called as 33 grade cement. 2. **43 Grade Cement: -** If the 28 days strength is not less than 43N/mm^2 when tested then it is called as 43 grade cement. 3. **53 Grade Cement: -** If the 28 days strength is not less than 53N/mm^2 when tested then it is called as 53 grade cement.	**2M**
Uses: - 1. **33 Grade Cement: -** Plastering, Brickwork, Tiling Work 2. **43 Grade Cement: -** Framed Structure, Load Bearing Structure. 3. **53 Grade Cement: -** Used for Dams, Bridges, R.C.C Structure.	**2M**
Q.1 b) Attempt any One of the following	**06**
i) Explain the procedure to determine bulking of sand and draw nature of graph showing maximum percentage of bulking.	
Procedure to Determine Bulking of Sand: - 1. The free moisture content in fine aggregate results in bulking of volume. 2. A sample of moist fine aggregates is filled into the measuring cylinder in normal manner. 3. Note down the level say "h_1", pour water into the measuring cylinder and completely inundate the sand and shake it. 4. Since the volume of saturated sand is same as that of dry sand the inundated sand completely offsets the bulking effect. 5. Note down the level say "h_2". Then "h_1-h_2" shows the bulking of the sample of sand under test. $$Percentage\ of\ Bulking = \frac{h_1 - h_2}{h_2} x\ 100$$ 6. The bulking factor can be found out by filling the wet sand in a water tight measuring box up to the top and then pour water to inundate sand. Then measure the subsidence of sand and express it as in percentage	4 M



2M for Diagram

ii) State the procedure for application of load on Coarse aggregate in crushing and impact test.

Procedure for application of load on coarse aggregate in Crushing: -

1. Take about 3Kg of oven dried aggregates sample and pass it through 12.5mm IS sieve and retained it from 10mm.
2. Fill the cylinder and measure it in three equal layers and tamp each layer by 25 times by tamping rod.
3. Place the plunger on the aggregates and place the whole assembly between plates of a compression testing machine.
4. Apply a load on sample at the rate of 4 tons per minute up to 40 tones.
5. Release the load and sieve the material.

3M

Procedure for application of load on coarse aggregate in Impact: -

1. Take about 3Kg of oven dried aggregates sample and pass it through 12.5mm IS sieve and retained it from 10mm.
2. Fill the cylinder and measure it in three equal layers and tamp each layer by 25 times by tamping rod.
3. Take the sample and fill it in the metal cup having base plate and tamp it with 25 times with tamping rod.
4. Raise the hammer till its lower face is 380mm above the upper surface of sample and allow it to freely fall on the sample by giving 15 blows at an interval of 1 sec.
5. Remove the crushed aggregates from the cup and record the readings.

3M

Q.2 Attempt any FOUR of the following — **16**

a) State the different grades of concrete as per provisions of IS 456-2000 and explain their properties

Different Grades of Concrete as Per IS 456-2000

a) M10 = 10 N/mm^2 b) M15=15 N/mm^2 c) M20 =20 N/mm^2 d) M25 = 25 N/mm^2

1) M stands for Mix Proportion.
2) The various mixes have minimum compressive strength after 28 days of curing.

2M

Proportion of Concrete: -

1. M 10 – 1:3:6 **2.** M 15 – 1:2:4 **3.** M 20 – 1:1.5:3 **4.** M25 – 1:1:2

2M

[Note- There is ambiguity in this question instead of properties it should be proportion of mix]

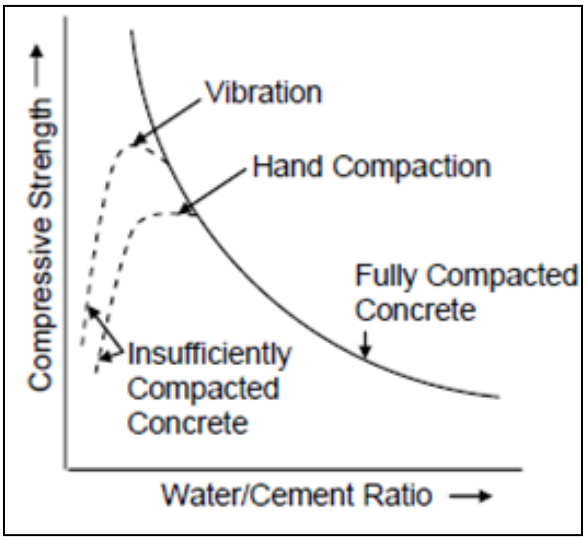
b) State Duff Abraham W/C law. State the significance of W/C ratio with regards to strength of concrete with the help of graph.

1. Duff Abram water cement law states that the strength of concrete only depends upon the water/cement ratio provided the mix is workable

$$S = \frac{A}{B^x}$$

Where x= water/cement ratio by volume for 28 days result.
A= constant and is 14,000 pound per square inch
B=7

2. Strength of concrete depends upon the strength of paste.
3. Lower water cement ratio is used when concrete is vibrated to achieve strength while at higher water cement ratio concrete is compacted with hand.
4. The lower the water cement ratio greater is the strength concrete and its strength decreases as the water cement ratio increases.



5. It is observed that 0.4 water cement ratio is sufficient to hydrate each cement particles completely.

½ M each for any four points

2M for Diagram

c) Define Workability of concrete. State any three factors affecting workability of concrete

Define Workability of Concrete:-

It is defined as the ease with which the concrete can be placed in the formwork, fills the formwork completely by flowing and ease with which it can be compacted.

1M

Factors affecting workability of concrete: -

1. **Water Cement Ratio: -**
   The higher the water content per cubic meter of concrete the higher will be the fluidity of concrete.
   More water can be added provided a corresponding higher quality of cement is also added to keep the water cement ratio constant so that the strength remains the same.
2. **Mix Proportion: -**
   Aggregate cement ratio is an important factor influencing the workability.
   The higher the aggregate cement ratio the leaner is the concrete.
   In case of rich concrete with low aggregate/cement ratio more paste is available to make the mix cohesive and to give better workability.
3. **Size of Aggregates: -**
   The bigger the size of aggregates the lesser is the surface area and hence less amount of water is required for wetting the surface.
   For given quantity of paste bigger size of aggregate will have higher workability.
4. **Shape of aggregates : -**
   Angular elongated or flaky aggregates makes the concrete very harsh when compared to rounded aggregates or cubical aggregates.

1M each for any three Factors

Rounded aggregates have less surface area and less void ratio as compared to angular aggregates and flaky aggregates.
River sand or gravel provide better workability than crushed sand and aggregates.

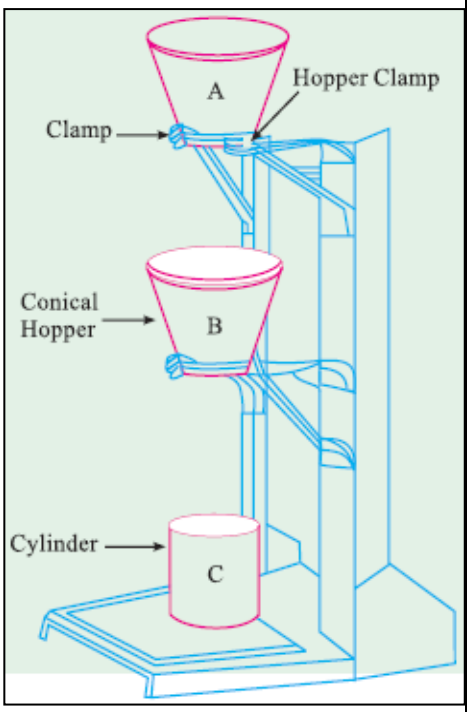
5. **Surface Texture : -**
The total surface area of rough texture aggregates is more than surface area of smooth rounded aggregates of same volume.
Rough textured aggregates will show poor workability and smooth or glassy textures aggregates will give better workability.
6. **Grading of aggregates : -**
Well graded aggregates are those which have less voids in given volume.
When the total voids are less excess paste is available to give better lubricating effect and it also prevents segregation of concrete.

d) Explain stepwise procedure of compaction factor test.

½ M for each

Compaction factor test is based on principle of determining the degree of compaction achieved by a standard amount of work done by allowing the concrete to fall through a standard height.

The degree of compaction called a compaction factor is calculated by density ratio i.e the ratio of density actually achieved in the test to density of same concrete fully compacted.



Procedure: -

1. Assume suitable proportion of concrete and mix it with water at selected water cement ratio apply thin coat of oil at inner surface of cylinder.
2. Weight empty cylinder as W_1.
3. Place the concrete in the upper hopper and level at top surface.
4. Open the trap door so the concrete falls in the lower hopper and remove the excess concrete remained in the cylinder of lower hopper and also the top cylinder.
5. Release the trap door and allow the concrete to freely fall in the cylinder & remove the excess concrete placed over cylinder.
6. Weight the cylinder.
7. Refill the cylinder with the same sample of concrete in layers by heavily compacting approximately 5cm deep and vibrate so as to obtain full compaction.

$$\text{Compaction Factor} = \frac{Weight\ of\ partially\ compacted\ concrete}{Weight\ of\ Fully\ Compacted\ concrete}$$

8. It is observed that the compaction factor depends upon the water cement ratio.

e) Write objectives of mix design of concrete. List any three methods of concrete mix design.

Objective of Mix Design of Concrete: - — 02 M

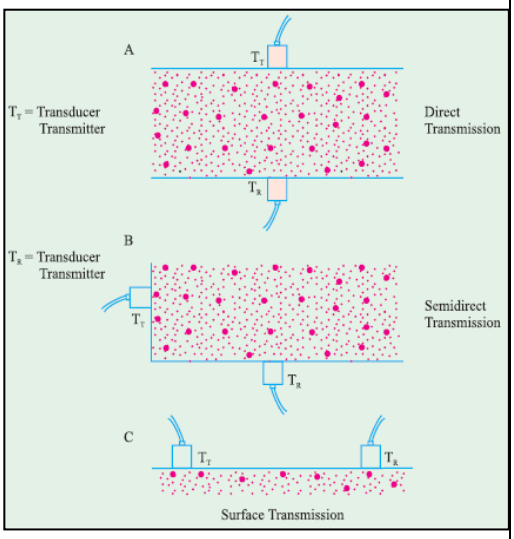
1. To achieve required workability of concrete.
2. To achieve required durability of concrete.
3. To achieve specified compressive strength of concrete for a specified grade.
4. To economies the concrete production.

Methods of Concrete Mix Design: - — 2 M for any three

1. Indian standard Method
2. Surface Area Method
3. Fineness Modulus Method.
4. American Method of Mix Design

f) Explain how ultrasonic pulse velocity test conducted and write specification to decide quality of concrete.

Ultrasonic Pulse Velocity Method: -



1. Ultrasonic pulse velocity method consists of measuring the time travel of an ultrasonic pulse passing through the concrete to be tested.
2. The pulse generated circuit consists of electronic circuit for generating pulses and a transducer for transforming these electronic pulses into mechanical energy having vibration frequency in the range of 15 to 50kHz.
3. The time travel between the initial path and the reception of the pulse is measured electronically.
4. The path length between transducer divided by the time of travel gives the average velocity of the wave propagation. — 2 M
5. PUNDIT(Portable Ultrasonic Non Destructive Digital Indicating Tester) is a battery operated fully digitized instrument which is generally used for measuring ultrasonic pulse velocity.
6. Techniques of measuring Pulse velocity through concrete :
   a) Direct transmission.
   b) Indirect transmission.
   c) Surface transmission.

Specification to decide quality control on concrete: - — 2 M

Sr.No.	Velocity Km/sec.	Classification (Quality)	Overall In Situ Compressive Strength N/mm^2
1	4.0 and above	Very Good	30 to 35
2	3.5 to 4.0	Good	25 to 30
3	3.0 to 3.5	Medium	20 to 25
4	3.0 to and below	Poor	15 to 20

Q3. Attempt any FOUR of the following — 16

a) Classify coarse aggregate based on size and shape and explain how it affects strength of concrete.

a) **Size: -**

i) The size of aggregates bigger than 4.75 is considered as coarse aggregate

ii) The aggregates whose size is 4.75mm and less is considered as fine aggregates. — 1 M

b) Shape: -

Sr.No	Classification	Description
1	Rounded	Fully worn or completely shaped by attrition
2	Irregular or partly rounded	Naturally irregular or partly shaped by attrition having rounded edges.
3	Angular	Possessing well defined edges formed at the intersection of roughly planer faces
4	Flaky	Material usually angular of which the thickness is small relative to the width and or length.

— 1M

Strength of Aggregate: -

Size: -

a) For well graded aggregate gives the higher strength as compared to poorly graded aggregate.

b) For bigger size of aggregate gives the better workability with minimum water cement ratio and hence strength is increased. — 1 M

Shape: -

a) The well shape of aggregates gives higher strength as compared to poorly shape aggregate.

c) Total Surface area of rough annular aggregates gives greater bond strength. — 1 M

b) Explain procedure to find specific gravity of fine aggregate is determined.

Procedure for Calculation of Specific Gravity of Fine Aggregates: -

1. Take any empty Pycnometer and weight it say W_1.
2. Take about 300 gram of oven dried sand and cool it in desiccator is placed in the Pycnometer and the Pycnometer is weighted say W_2.
3. The remaining Pycnometer is filled with water and its weight is noted W_3.
4. The Pycnometer is emptied clean and dried and weighted after filling it completely with water till the top of the cap say W_4.
5. Weight of Dry Soil $W_s = W_2-W_1$
6. Weight of equal volume of water = $(W_2-W_1) – (W_3-W_4)$
7. Specific Gravity = $G = \frac{W_2-W_1}{(W_2-W_1)-(W_3-W_4)}$

— 4 M

c) Explain Procedure to Find Fineness Modulus of Course Aggregate.

1. Prepare the test sample air dry by drying it at room temperature or by heating it at a temperature of 100° to 110°C in an oven and then cooling it to the room temperature.
2. The dried sample is then weighted
3. The weighted sample is placed on the sieve and sieved on appropriate sieves starting with the largest.
4. Each sieve is shaken separately over a clean tray until not more than a trace

passes, but in any case of period of not less than 2 min., the shaken is done in backward and anticlockwise direction. **5.** If the sieving is to be done by sieve shaker then it is to be done for 20min. **6.** At the end of sieving 150 micron are cleaned from bottom by light brushing with fine hair brush. **7.** On completion of sieving the material retained on each sieve together with a material cleaned from mesh is weighted. **8.** The fineness modulus of coarse aggregate is calculated by $F.M = \frac{\Sigma\ Cumulative\ percentage\ weight\ retained\ upto\ 150\ micron}{100}$	½ M each
d) Explain Los Angles method of abrasion value determination for coarse aggregate and also write IS requirement for this value.	
Los Angeles Abrasion Value: - 1. In this test the relative resistance of aggregate to wearing is calculated. Procedure: - 1. Aggregate should be clean and oven dried at a temperature of about 105° to 110° C. 2. Aggregates should be sieved and should passed through 12.5mm IS sieve and retained on 10mm IS sieve. 3. Placed the aggregates weighing 1250 gm and abrasive chargers in Los Angeles Testing machine. 4. Rotate the machine at the speed of 20 to 30 revolutions per minute for 500 revolutions. 5. At the completion of the test discharge the material from the machine. 6. Make separation of the sample on the sieve coarser than 1.7mm sieve and sieve the finer portion on 1.7mm IS sieve. 7. Wash the material coarser than 1.7mm IS sieve and dry it in oven at 105° to 110° C. and weight accurately to nearest one gram. 8. The difference between original weight and the final weight of the test sample is expressed as percentage of original weight of test sample, this is called as percentage wear. The IS requirement for abrasion value of coarse aggregate shall not exceed the following values. For aggregates to be used in concrete for wearing surfaces - 30 percent For aggregates to be used in other concrete - 50 percent	3M 1M
e) State the working principal of rebound hammer and write any two factors affecting rebound hammer.	
Rebound Hammer Test: - The test is based on the principle that the rebound of an elastic mass depends on the hardness of the surface against which mass strikes. The plunger of hammer is pressed strongly and steadily against the concrete surface at right angles to its surface, until the spring loaded mass is triggered from the locked position. The spring controlled mass rebounds and the extent of such rebound depends upon the	2 M

surface hardness of concrete. The distance traveled by the mass as a percentage is defined as rebound number.

Factors Affecting Rebound Hammer Index:-

1. Smoothness of the surface under test.
2. Size, shape and rigidity of the specimen.
3. Age of specimen.
4. Surface and internal moisture condition of specimen.
5. Type of coarse aggregate.
6. Type of cement
7. Type of mould.
8. Carbonation of concrete surface.

1M (each for any two factors)

Q.4 a) Attempt any THREE of the following:	**12**
i) Enlist the various concrete operations in sequence and explain any one in detail.	

Concrete Operations in sequence:

1. Batching and mixing,
2. Transportation of concrete,
3. Placing in the formwork,
4. Compaction,
5. Finishing,
6. Curing.

2 M

Explanation of one operation:

- **Batching:** The measurement of materials for making concrete is known as batching.
  There are two types of batching:
  - Volume Batching: It is the method of proportioning the materials by volume of ingredients used for concrete.
  - Weight Batching: It is the method of proportioning the materials by weight of ingredients used for concrete.

2M for any one Operation

- **Mixing:** Thorough mixing of the materials is essential for the production of uniform concrete. It ensure that the mass become homogeneous, uniform in colour and consistency. There are two methods adopted for mixing concrete:
  1. Hand mixing
  2. Machine mixing.
- **Transportation:** concrete can be transported by a variety of materials and equipment. The precaution to be taken while transporting concrete is that the homogeneity obtained at the time of mixing should be maintained while being transported to the final place of deposition. While transportation of concrete, it may not get settled, Segregated and bleeded.
  The methods adopted for transportation of concrete are:
  - Mortar pan
  - Wheel Barrow, Hand Cart
  - Crane, Bucket and Rope Way
  - Truck Mixer and Dumpers
  - Belt Conveyors
  - Chute
- **Compaction:** it is the process adopted for expelling the entrapped air from the

concrete. The following methods are adopted for compacting the concrete:

- a) Hand Compaction
  - i. Rodding
  - ii. Ramming
  - iii. Tamping
- b) Compaction by Vibrators
  - i. Needle Vibrator
  - ii. Formwork Vibrator
  - iii. Table vibrator
  - iv. Surface vibrator etc.
- Compression by pressure and jolting
- Compaction by Spinning

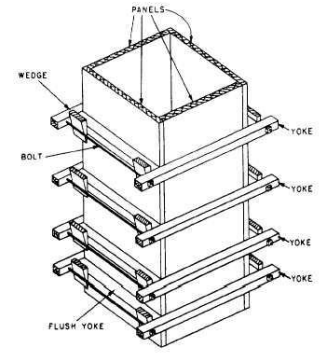
ii) State what is batching. What are the types of batching?

Batching: The measurement of materials for making concrete is known as batching. There are two types of batching: — 2 M

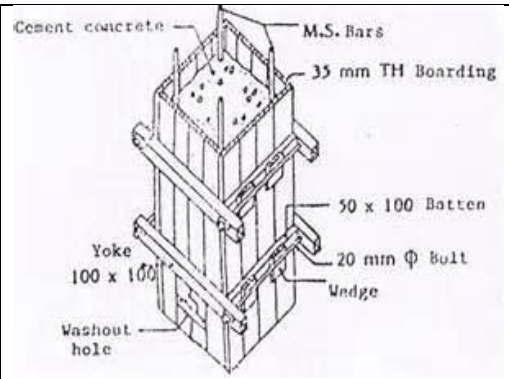
1. **Volume Batching:** It is the method of proportioning the materials by volume of ingredients used for concrete. — 1 M
2. **Weight Batching:** It is the method of proportioning the materials by weight of ingredients used for concrete. — 1 M

iii) Draw a figure of formwork used for column. Also state stripping time of form work for beam and slab

Figure of formwork used for column: — 2 M



Formwork used for column [OR]



Formwork used for column

Stripping time of form work for beam and slab:

1. Soffit formwork to slabs (props to be refixed immediately after removal of formwork) – 3 day
2. Soffit formwork to beams (props to be re fixed immediately after removal of formwork) – 7 day
3. Props to slab
   - i. Spanning up to 4.5 m – 7 day
   - ii. Spanning over 4.5 m – 14 day
4. Props to beam
   - iii. Spanning up to 6m – 14 day
   - iv. Spanning over 6 m – 21 day

½ M each

iv) What are the precautions to be taken while transportation of concrete?

The precaution to be taken while transporting concrete — 1M each for any four

1. Is that the homogeneity obtained at the time of mixing should be maintained while being transported to the final place of deposition.

2. While transportation of concrete, it may not get settled, **3.** It may not get Segregated **4.** It may not get bleeded. **5.** Concrete should be in agitation condition during transportation **6.** Over bucket transportation should be avoided **7.** For as a precaution of transportation mixing and placing distance should be minimum.	
Q.4 b) Attempt any ONE of the following:	**6**
i) Explain any three methods of curing of concrete.	
Curing methods may be divided broadly into four categories: 1. Water curing by Immersion, Spraying, Wet Gunny Bags covering and ponding method. 2. Membrane curing by different sealing compounds. 3. Application of heat by steam Curing. 4. Miscellaneous method like Infrared radiations, Electrical curing and use of calcium chloride and admixtures. **Water curing:** This is the best method of curing as it satisfies all the requirements of curing, namely promotion of hydration, elimination of shrinkage and absorption of the heat of hydration. Water curing can be done in the following ways: Immersion, Spraying, Wet Gunny Bags covering and Ponding method. **Membrane curing:**In the areas where there is acute shortage of water, this method is more promoted. It is good method of maintaining a satisfactory state of wetness in the body of concrete to promote continuous hydration when original water/cement ratio used is not less than 0.5. To achieve best results, membrane is applied after one or two days of actual wet curing. Two or three coats may be required for effective sealing of the surface to prevent the evaporation of water. Some of the materials that can be used for this purpose are bituminous compounds, polyethylene or polyester film, waterproof paper, rubber compounds etc. **Application of heat by steam Curing:** by subjecting the concrete to higher temperature and maintaining the required wetness by steam curing, accelerates the hydration process resulting faster and earlier development of strength of concrete.	2 M 2 M 2 M
ii) State any two methods of water proofing and explain any one method.	
Methods adopted for water proofing are as follows: • By use of pore fillers • By use of water repellent admixtures. **By use of pore fillers:** Chemically active pore fillers like silicate of soda, aluminium and zinc sulphates and aluminium and calcium chloride accelerate the setting time of concreteand thus render concrete more impervious at early age. Also the chemically inactive pore filling materials like chalk, fullers earth and talc are use to improve the workability and to facilitate the reduction of water to make concrete dense and impervious. **By use of water repellent admixtures:**Some materials like soda, potash soaps, calcium soaps, resins, vegetable oils, fats and coal tar residues are added as water-repelling materials in the form of admixture. In some kind of water proofing admixtures inorganic salts of fatty acids, usually calcium or ammonium stearate or oleate will mainly act as water repelling materials.	2M 4M for any one method

Q.5 Attempt any FOUR of the following;	**16**
a) What is an admixture? State any four admixtures used in concrete.	
Admixture is defined as a material, other than cement, water and aggregates, which is used as an ingredient of concrete and is added to the batch immediately before or during mixing. 1. Plasticizers. 2. Super plasticizers. 3. Retarders and Retarding Plasticizers. 4. Accelerators and Accelerating Plasticizers. 5. Air entraining admixtures. 6. Pozzolanic or mineral admixtures. 7. Damp proofing and waterproofing admixtures. 8. Gas forming admixtures. 9. Air detraining admixtures. 10. Alkali aggregate Expansion inhabiting admixtures. 11. Workability admixtures. 12. Grouting admixtures. 13. Corrosion inhabiting admixtures. 14. Bounding admixtures. 15. Fungicidal, germicidal, insecticidal admixtures. 16. Coloring admixtures.	2M ½ M each for any four
b) State any four properties of high performance concrete.	
Properties: 1. High workability 2. High strength 3. High modulus of elasticity 4. High density 5. High dimensional stability 6. Low permeability and Resistance to chemical attack.	1M each for any four
c) What are the precautions to be taken while concreting under extreme cold conditions	
Precautions: 1. Utilization of the heat developed by the hydration of cement. 2. Selection of suitable type of cement. 3. Economical heating of materials of concrete. 4. Admixtures of anti freezing materials. 5. Electrical heating of concrete mass. 6. Use of air-entraining agents. 7. Use of insulating formwork.	1M each for any four

d) State difference between retarding admixtures and accelerating admixtures.

Points	Retarding admixtures	Accelerating admixtures
Hydration Process	It slows down the rate of hydration of the cement paste in the fresh concrete.	It accelerates the rate of hydration of the cement paste in the fresh concrete.
Setting Time	It delays or prolongs the setting of the cement paste in the fresh concrete.	It speedups the setting of the cement paste in the fresh concrete.
Removal Time of formworks	It delays or moderate the time for removal of formwork.	Permit earlier removal of formwork.
Whether Conditions	More suitable in Hot Whether Concreting.	More suitable in Cold Whether Concreting.

1M each differnce

e) Compare air entrain admixtures with super plasticizers.

Purpose: Air entraining admixtures incorporate millions of non-coalescing air bubble, which acts as flexible ball bearings and will modify the properties of plastic concrete regarding workability, segregation, bleeding and finishing quality of concrete. It also modifies the properties of harden concrete regarding its resistance to frost action and permeability. Whereas super plasticizer is that plasticizer does not create any bubbles and thus retain the density and permeability of the original concrete and act by adsorbing on the surface of cement particles by forming thin molecular film surrounding the cement particles.

Material: Air entraining admixtures–Natural wood resins, Animal and vegetable fats and oil, alkali salts, water soluble soaps and aluminum powder etc.

Super plasticizers- Acrylic polymer based, copolymer of carboxylic acrylic acid, cross linked acrylic polymer etc.

Use: Air entraining admixtures are used to make light weight concrete like auto cleaved aerated blocks, for aesthetic plaster etc. Whereas super plasticizers are the high water reducer which use to make high strength dense concrete.

Water reduction: Another difference is that plasticizer does not react with water and cement but permits 30% water reduction without affecting workability , whereas air entrain admixture react with water to form natural gas of thousands of tiny bubble.

Location: Air entraining admixtures – Precast Blocks, Light weight Structure etc. Super plasticizers – Dense reinforcing structural members, highway and bridges, etc.

1 M each for any four points

f) What is light weight concrete? Where it is used?

Light Weight Concrete:-The concrete whose density varies from 300 kg/m^3 to 1850 kg/m^3 which is much less than ordinary conventional normal concrete whose density differs from 2200 $kg/m^3$to 2600 kg/m^3. **OR**
It is the one which is comparatively lighter in weight than conventional concrete but at the same time strong enough to be used for structural purpose.

Uses : - a)It is used where, the reduction in dead load is more important in case of weak soil and tall structure.

b) Also, where the low thermal conductivity is prominent in extreme climatic

2M

(OR 2M)

1M

1M

conditions.	
Q.6 Attempt any FOUR of the following:	
a) State any four requirements for good form work.	
A good form work should satisfy the following requirements: 1. It should be strong enough to resist the weight of concrete, workers and machineries. 2. It should be rigid enough to retain its shape without any deflection or deformation beyond permissible limits. 3. It should be economical compared to cost of construction. 4. It should be smooth finish and shaped. 5. It should be durable. 6. It should be easily and locally available. 7. Self weight should be less. 8. It should be easily and repeatedly transportable.	1M each for any four points
b) Explain any one method of joining old and new concrete.	
[Note- There is ambiguity in this question instead of methods it should be procedure of joining old and new concrete.] When new concrete is done in continuation with old concrete after a time gap of some months or even years, then the new and old concrete must have a strong bond with each other. The procedure of joining new and old concrete is as follows: a) Cleaning – the old surface is first cleaned thoroughly with wire brush. b) Chiseling – the old concrete surface is made rough by denting it with a chisel for a strong bond with new concrete. c) Use of rich cement slurry or paste – using rich cement paste will give additional strength to the joint as this will make the concrete surrounding the joint richer and stronger. d) Splicing of reinforcement –to give homogeneity to the reinforcing bars, overlap is provided and the overlapped portion in bound tightly with tensile steel wire.	1 M for each
c) Explain the significance of water reducing admixture in concrete with respect to properties of concrete.	
Water reducing admixture is also called as plasticizers and their significance on properties of concrete are as follows: **1.** Workability- It increases workability of concrete. **2.** Strength- Water reducing agent increases strength of concrete. **3.** Durability- The reduction in water/cement ratio improves the durability of concrete. **4.** Segregation and bleeding- It reduces the tendency for segregation and bleeding.	1M each
d) What is ready mix concrete? State any four advantages of RMC.	
Ready Mixed Concrete:- The concrete which batched and mixed at central plant instead of being on site of construction and is delivered for placing from a central plant to it, is called Ready Mix Concrete. **Advantages:** **1.** Quality of concrete is high and uniform. **2.** Useful in congested urban areas. **3.** Can be available in required quantity on site.	2M ½ M each for any four

4. There is no need to invest money for raw materials and infrastructure. **5.** For congested reinforcement the RMC is useful **6.** No dust and noise pollution	
e) What is segregation and bleeding? Suggest any two ways by which segregation and bleeding can be avoided.	
Segregation: It can be define as separation of the constituent materials of concrete so that their distribution is no longer uniform. **Bleeding:** It is a form of segregation in which some of the water in the mix tends to rise to the top surface of freshly placed concrete. **Method to avoid segregation** **1.** By proper proportioning of mix of concrete. **2.** The water cement ratio should be kept constant. **3.** By proper, uniform and complete mixing. **4.** By taking proper precautions in placing, compaction and transportation of concrete. **Method to avoid segregation and bleeding:** **1.** By proper proportioning of mix of concrete. **2.** The size of aggregate should be kept as small as possible. **3.** By proper, uniform and complete mixing. **4.** The richer concrete should be used\ **5.** Excessive vibration should not be used.	1M 1M 1M 1M