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Paper :- Concrete technology

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7  
Ans)

ANSWER NO. 7

## FACTORS AFFECTING WORKABILITY

i) Porosity and Absorption ⇒

porous and non-saturated aggregate will require more water than a non-porous and saturated aggregate. The workability of the former is less than the latter.

ii) Air Entaining Agent ⇒

Workability also increases with addition of air entraining agents which produce well dispersed air bubbles. Use of air entraining being surface-active reduces

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the internal friction between the particles. It can be viewed that air bubbles act as a sort of ball bearing between particles to slide past each other and give easy mobility to the particles.

iii) Coarse Aggregate To Fine Aggregate Ratio  $\Rightarrow$

High ratio of coarse to fine aggregate can result in a lower workability.

Conversely, too many fines leads to higher workability but such mixes makes less durable concrete.

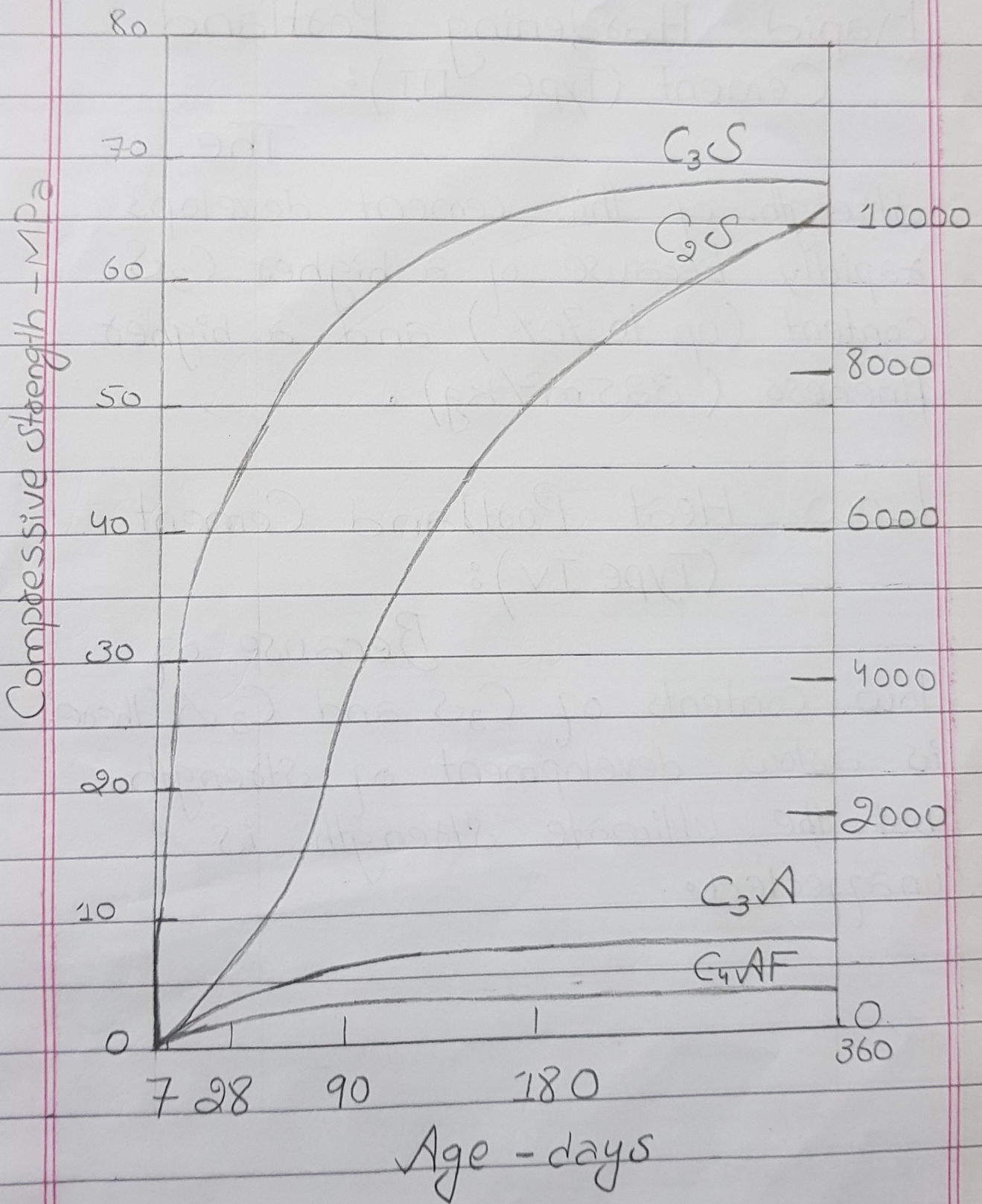
iv) Grading Of Aggregate  $\Rightarrow$

The better the grading, the less is the void content and higher the workability.

Grading is more important when lean mixes of high workability are required than rich mixes. For lean mixes, the grading should be continuous, whereas for rich mixes the grading should be coarse.

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ANSWER NO: 2



Strength development of pure  
Compounds of Cement

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## ANSWER NO: 3

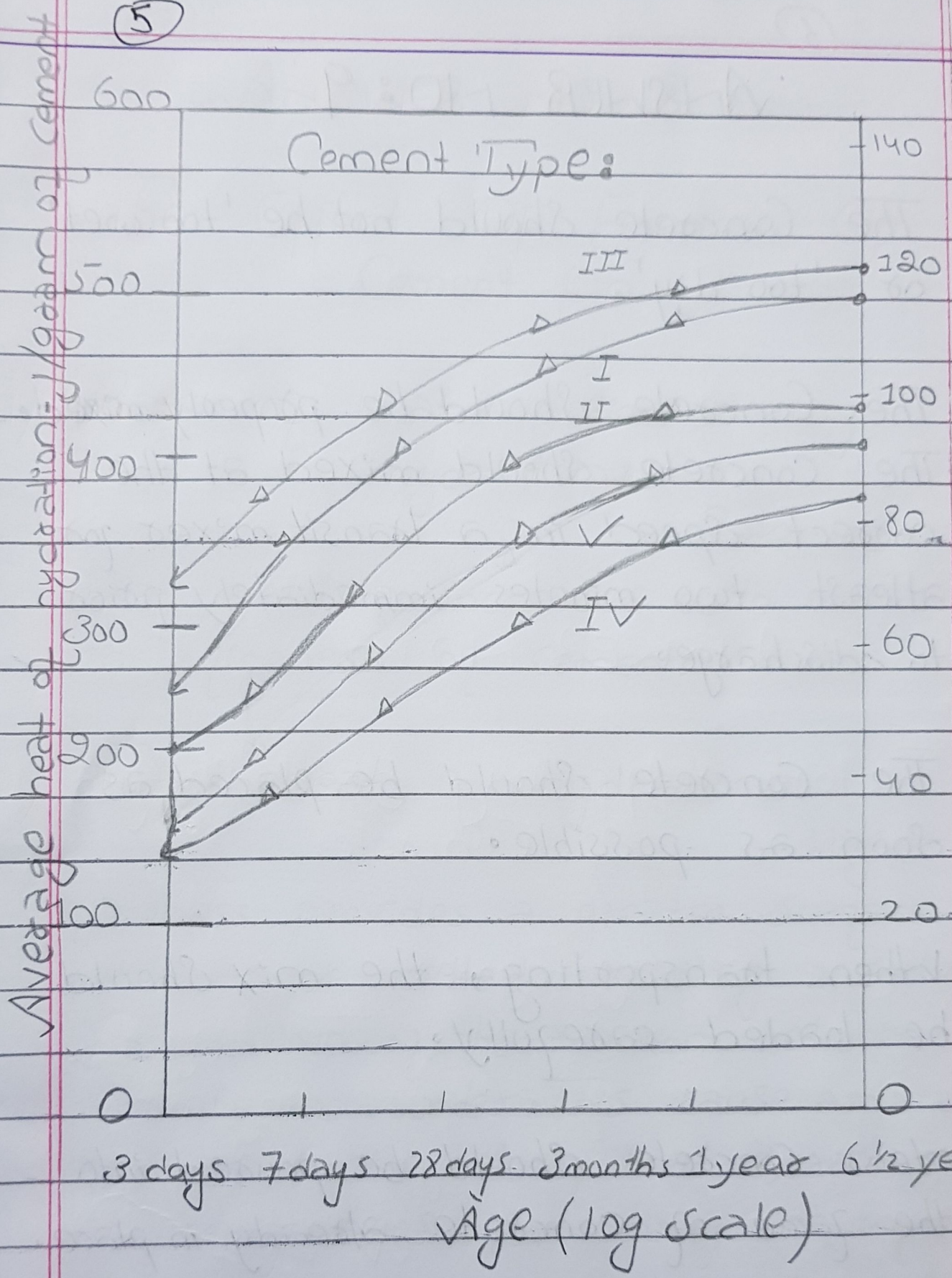
Rapid Hardening Portland Cement (Type III):

The strength of this cement develops rapidly because of a higher  $C_3S$  content (up to 70%) and a higher fineness ( $325\text{m}^2/\text{kg}$ ).

Low Heat Portland Cement (Type IV):

Because of low contents of  $C_3S$  and  $C_3A$  there is a slow development of strength but the ultimate strength is unaffected.

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Development of heat of hydration of different cement types

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## ANSWER NO: 9

- ⇒ The Concrete should not be 'too wet' or 'too dry'.
- ⇒ The Concrete should be properly mixed. The Concrete should be mixed at the correct speed in a transit mixer for at least two minutes immediately prior to discharge.
- ⇒ The Concrete should be placed as soon as possible.
- ⇒ When transporting, the mix should be loaded carefully.
- ⇒ New Concrete should be poured into the face of concrete already in place.
- ⇒ If Concrete is placed straight from a truck, it should be poured vertically and the concrete should not fall from more than one-and-a-half meters height.

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ANSWER NO : 8

The Effect Of Fineness Of Cement On :

i) Rate of heat evolution during hydration :

Rate of heat evolution increases with increase in fineness of cements.

ii) Total heat of hydration :

Higher fineness provides a greater surface area to be wetted, resulting in an acceleration of the reaction between cement and water. This causes an increase in the rate of heat liberation at early ages, but does not influence the total amount of heat developed over several weeks.

iii) Strength Of Concrete :

The compressive strength of concrete

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increases with increase in cement fineness.

iv) Workability of Concrete.

An increase in the fineness of cement results in increase in workability of concrete.

ANSWER NO: 6

Factors Affecting Bond Strength of Concrete:

i) Shape of aggregate:

The larger surface area of a more angular aggregate provides a greater bond compared to rounded aggregate.

ii) Size of aggregate:

Bond strength is greater in fine aggregate compared to coarse aggregate.



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iii) Texture of aggregate:

A rougher texture results in a greater adhesion or bond between the particles and the cement matrix compared to smooth texture.

iv) Bleeding:

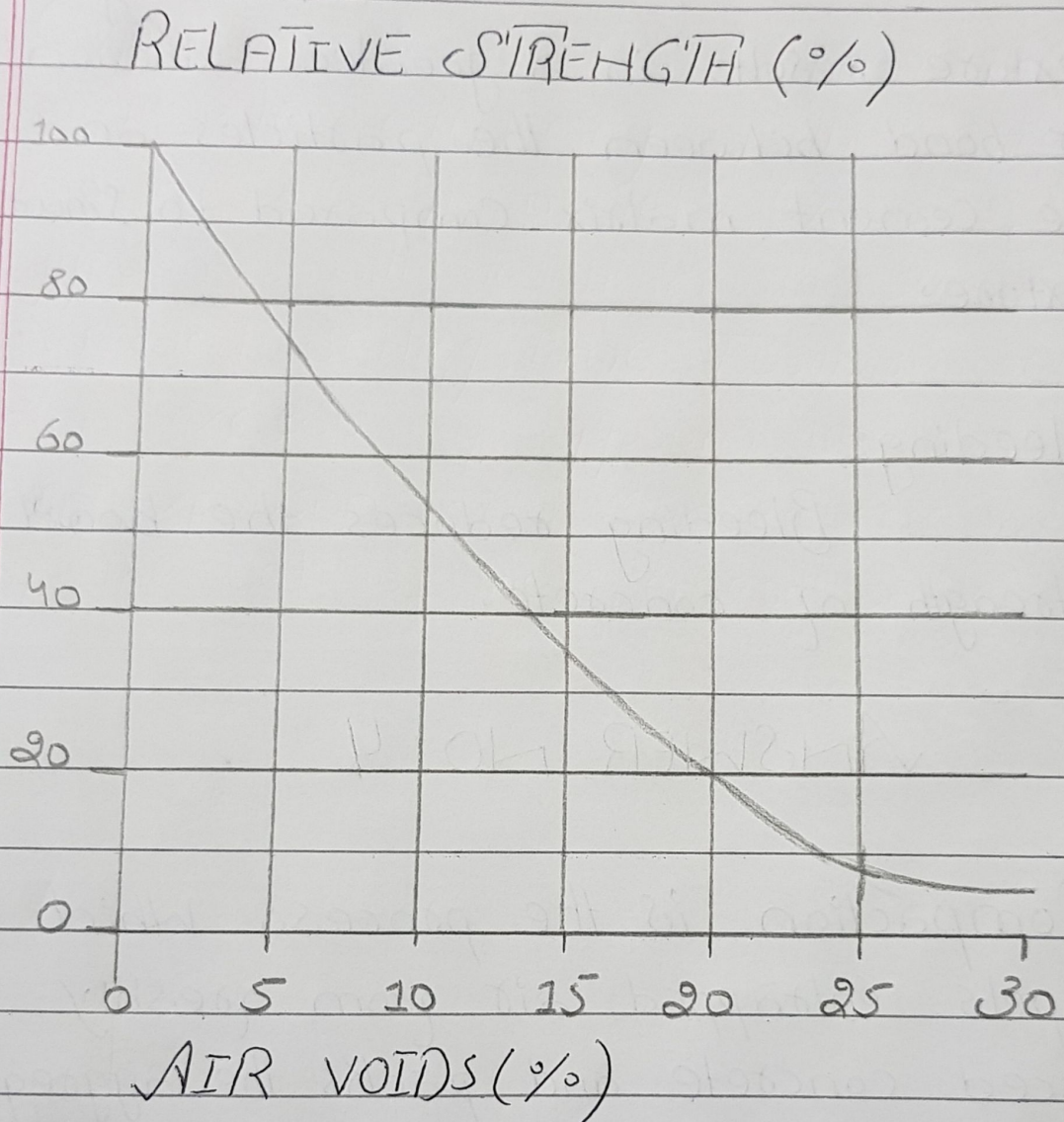
Bleeding reduces the bond strength of concrete.

ANSWER NO: 4

Compaction is the process which expels entrapped air from freshly placed concrete and packs the aggregate particles together so as to increase the density of concrete. Poor compaction of concrete reduces its strength, durability and could possibly affect its surface finish. Poor compaction can reduce the strength significantly. The strength of concrete containing 10% of entrapped air (air voids) may be as little as 50% that of the concrete when fully compacted.

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as seen in the following graph.



Loss of Strength Through Incomplete Compact.

ANSWER NO: 1

Flash Set:

It is the immediate stiffening of cement paste in a few minutes after mixing with water. It

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is accompanied by large amount of heat generation upon reaction of  $C_3A$  with water. Gypsum is added in cement to prevent flash set.

False Set:

It is a rapid development of rigidity of cement paste without generation of much heat. This rigidity can be overcome & plasticity can be regained by further mixing without addition of water. In this way cement paste restores its plasticity & sets in a normal manner without any loss of strength.

False Setting Can be Prevented By:

- a) Making sure to prevent the contact of gypsum with hot clinker.
- b) Not storing in places with high humidity.

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## ANSWER NO: 5

Gypsum is added to prevent immediate stiffening of the paste, known as "flash set". Excess of gypsum will result in undesired retarded setting time. Furthermore, an excess of gypsum leads to an expansion and consequent disruption of the set of the cement paste.