لجنة امتحانية

مواد بناء
مرحلة اولى

University of Baghdad

College of Engineering

Civil Engineering Department

Construction Material

First Class

First Attempt- 3.0Hour

Note: Answer five question only

Q(1): Define: F.S.P , Hardening of gypsum , Brittleness , Drain tiles , Single firing technology

Q(2): A\ Explain the manufacture of blocks?

B\ Compare between plaster of Paris and cement keen?

Q(3) : Fill in the blanks :

1. Excess of lime makes the color of brick .....
2. Structural axes of wood: Longitudinal axis is .....
3. Hourdy blocks are the perfect solution for humidity because of ..... properties
4. Pot tile sometimes called.....
5. The percentage of SO_3 .....45% of plaster of Paris.

Q(4) A\Draw :

1. Compressive strength and moisture content of timber
2. Stress-strain for both high carbon steel and structural steel

B\Give a scientific explanation:

1. Ordenary plaster dose not be used for finishing coat?
2. Faces of blocks should be rough?

Q(5):A\ Count the Characteristics of good tiles?
B\ Explain: The theory of calcinations (gypsum plaster)?

Q(6): Standard bricks were tested in the lab; the results are presented in the table below:

Sample Number	Absorption (%)	Compressive strength (MPa)	Specific gravity
1	17	20	2
2	20	13	1.9
3	25	10	1.75

Find:

1. The forces that led's to failed the samples (for the average three samples)
2. Weight of the absorbed water for each sample

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الدور الاول

Q(1): Define:

1. **Fiber Saturation point:**
   The moisture content at which all free water is removed (i.e. cell cavities empty) while the cell walls are fully saturated. Changes in moisture content below the fiber saturation point are associated with shrinkage and swelling, as well as variation in strength and elastic properties and other properties. Fiber saturation point in range general between 20 to 32%.
2. "Hardening": means the subsequent gain in strength and in ability to resist indentation or abrasion.
3. Brittleness: The opposite to toughness ductility and give indication for impact resistance or dynamic strain, the deformation and failure occurs in brittle materials without graduated deformation and called sudden failure or sudden breakage, example for brittle materials such as: concrete, glass, brick, wood and gypsum.
4. Drain tiles: Usually are long curved sections of various shapes and sizes such as semi-circular or circular. They are used for draining waste water and for carrying sewage glazed tiles should be used.
5. "Single firing technology ": is a new automatic process achieved the following advantages:
   -drastic reduction of the firing circle from 72 hours to an average of just one hour.
   -reduced fuel consumption
   -reduced total cost of production
   -improved quality design of the burnt tiles.

Q(2) : A\ **Manufacture of blocks:** Blocks are made from cement and water and the sand will be added gradually, then mix it in the mixer for about 5 minutes to have homogeneous mix, then pour the mix in the moulds. Open the moulds and leave the block for 14 day before use. To check the strength of the block its important to test one sample before use. Blocks used in many applications such as bearing walls or filling concrete skeletons. All the problems that faces the block works related to cracking and settlement when foundation is weak. The main purpose for block failure in structure appears when it is exposed to water; therefore it should be ensured that construction joints between blocks should be strong.

B\ ***Keen cement:***

It is anhydrous plaster produced the calcinations, at a red heat or over, of gypsum to which certain substances, usually ($Al_2(SO_4).2\text{-}18H_2O$) had been added.

1.3.5.1 Properties:

a. Its set is extremely slow, usually between 1-7 hours.
b. It gains in strength very gradually, but ultimately attains a great degree of hardness and a strength exceeding that of any ordinary gypsum plaster.
c. Its plasticity is high.
d. Its resistance to water is higher than ordinary plaster.

1.3.5.2 Uses:

a. It is used as a wall plaster in finishing coat and comers.
b. It is used as a wall plaster in areas exposed to moisture instead of cement and lime.

Plaster of Paris:

Produced by calcinations of pure gypsum, no foreign materials being added either during or after calcinations.

1.3.1.1 Uses:

a. It is used as a wall plaster in finish coat.
b. It is used as a mortar for masonry construction.
c. It is used for casting ornamental work.

1.3.1.2 Chemical requirements in accordance with Iraqi standard No. 28/1988:

a. The sum of soluble salts expressed as (Na_2O+MgO) not more than 0.25% by weight of plaster.

c. The percentage of impurities not more than 5%.

d. The percentage of SO_3 not less than *45%*

e. The percentage of CaO not less than 30%.

1.3.1.3 Physical requirements in accordance with Iraqi standard No. 28/1988:

a. Fineness: The percentage retained on 1.18mm sieve not more than 0%.

b. Setting time should be between 8-25 minute.

c. Mechanical resistance: The diameter impression resulted by a dropping ball not more than 5mm.

d. Compressive strength: Not less than 5MPa for standard cube 50*50*50mm.

e. Modulus of rupture: Not less than 1.5MPa

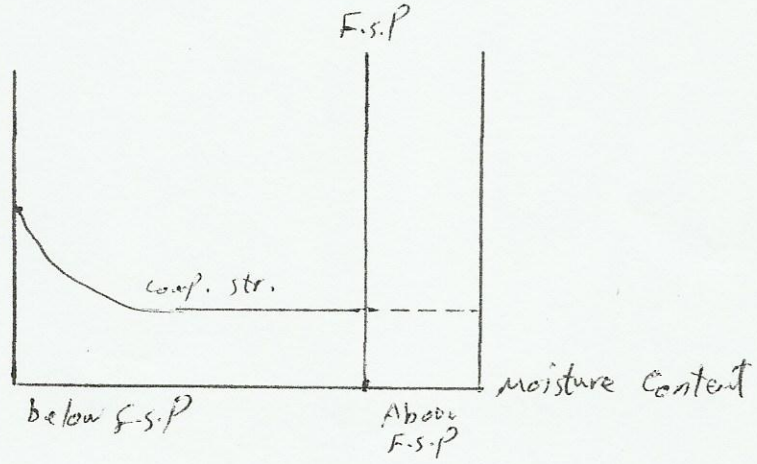
Q(3): Fill

1. Excess of lime makes the color of brick … **yellow instead of red** ….
2. Structural axes of wood: Longitudinal axis is … **Parallel to the length of the fiber** ...
3. Hourdy blocks are the perfect solution for humidity because of … **UPVC** .. properties
4. Pot tile sometimes called…… **pan tiles** ……
5. The percentage of SO_3 … **not less than** …..45% of plaster of Paris.

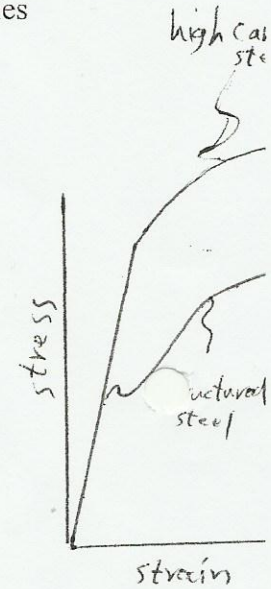
Q(4)

A\ Draw

1



2



Q4) B) Give scientific explanation

1- because it's Produced by the Calcinations of gypsum Conte certain natural impurities, so the colour will no be Pure

2- to ensure cohesion between the block and finishing layers

Q(5): A\ **a good tiles should posses the following characteristics:**

1-should posses uniform color

2-should be properly burnt

3-should be free from cracks, flaws or bends

4-should be hard and durable

5-should have proper shape and size

6-when placed in position, it should fit well

7-its broken surface should exhibit even and compact structure

8-it should give a clear ringing sound when struk with light hammer or with another tile.

B\ ***Theory of calcinations:*** If pure gypsum is subjected to any temperature above 100 °C, but not exceeding 190 °C, three-fourth of the water of combination originally present is driven off:

$$CaSO_4.2H_20 \xrightarrow{100\text{-}190\ °C} CaS04\ .\tfrac{1}{2}H_2O + 1\tfrac{1}{2}\ H_2O$$

The resultant product is called plaster of Paris ($CaSO4.\ \tfrac{1}{2}\ H_2O$). Plaster of Paris readily recombines with water to form gypsum, hardening in a very few minutes:

$$CaSO_4.\ \tfrac{1}{2}\ H_2O + 1\tfrac{1}{2}\ H_2O \longrightarrow CaSO_4.2H_2O$$

If the gypsum is calcined at temperature much above 190 °C it losses all its water of combination, becoming an anhydrous sulfate of lime:

$$CaSO_4.2H_20 \xrightarrow{T>\ 190\ °C} CaSO_4 + 2\ H_2O$$

Q(6):

① معدل مقاومة الكسر

Av. comp. strength $= 20 + 13 + 10 = \frac{43}{3} = 14.33$ Mpa

com. stress $= \frac{P}{A} = \frac{P}{27,600} = 14.33$ $\quad A = 11.5 * 10 \times 24 * 10 = 27,600\ mm^2$

$\Rightarrow P = 395508\ N \Rightarrow 395.5\ kN$

② Absorption $= \frac{\text{wt. of water in the pores}}{\text{wt. of the sample}}$, sp. gr $= \frac{\text{Brick كثافة}}{\text{water كثافة}}$

الوزن ∴ wt of Brick (1) $= \underset{gm/cm^3}{2 * 1} * \underset{cm^3}{(7.5 * 24 * 11.5)}$ (volume) $= 4140$ gm

∴ wt. of water in the pores (1) $= \frac{17}{100} * 4140 = \underline{783.36\ gm}$

sample(2) $1.9 * 1 * (7.5 * 11.5 * 24) = 3933$ gm

wt. of the Brick

wt. of the observed water $= \frac{20}{100} * 3933 = \underline{786.6 \text{ gm}}$

sample(3) $= 1.75 * 1 * (7.5 * 11.5 * 24) = 3622$ gm

wt. of the observed water $= \frac{25}{100} * 3622 = \underline{905.6 \text{ gm}}$