



Subject: Building Construction
Division: Structure
Examiner: Dr. Qais Jawad Frayyeh

Year: Second
Time: 3hrs.
Date: 01 /06/2015

Note: Answer only four questions

Q1/ Draw with suitable scale longitudinal section for exterior wall for store 8*6 m interior clear dimensions from first layer of filling till five courses above DPC according to the following data:

- a. Wall constructed with clay bricks
- b. Depth of excavation is 150 cm
- c. Depth of water ground level is 50 cm
- d. The soil need to strength by 200 mm of boulder and 300 mm of sub base
- e. Width of foundation is 75 cm
- f. Thickness of foundation is 30 cm
- g. Interior finish floor level is +40 cm from natural ground level and it is concrete pavement 20 cm thickness
- h. There is walkway from concrete pavement 10cm thickness around the building 1m width at +15 cm from natural ground level

Enhance your drawing with full details and dimensions (25%)

Q2/ Store in (Q1) have slab from concrete cast in site 20 cm thickness with bar reinforcement $\text{Ø}12 @ 15 \text{ cm}$ in two directions. Draw top view for the slab with suitable scale to indicate the all details of bar reinforcement, also draw section through the slab at the one edge to indicate the full details of roof layers in additional to bar reinforcement. (25%)

Q3/ What are the main objective of the followings:

- a. Steel frame for some buildings.
- b. Lintels in buildings.
- c. Pin vibrators during lying of concrete.
- d. Precast concrete piles.
- e. Earth filling. (25%)

Q4/ Write a brief comment on properties of stones and properties of brick. (25%)

Q5/ Discuss the followings:

- a. Ribbed slab
- b. Kinds of concrete masonry units. (25%)

III
 plastering with
 gypsum 20 mm +
 int. plastic paint

Concrete pavement 200 mm
 Sub base 100 mm
 Sub grade - splitting
 100 mm +
 100 mm Cement
 + 0.4%
 E.L. + 0.4%
 100 mm
 150 mm
 200 mm
 F.G.L.
 0.0

plastering with gypsum
 mortar 20 mm +
 ext. plastic paint

DPC 200 mm

Concrete pavement 100 mm
 Sub base 100 mm
 Sub grade

Ex. Joint 20 mm
 Filled with E.F.L. + 0.4%
 masonry

Brick wall 240 mm
 Plastering with
 Cement mortar 5 mm
 Water proof 20 mm



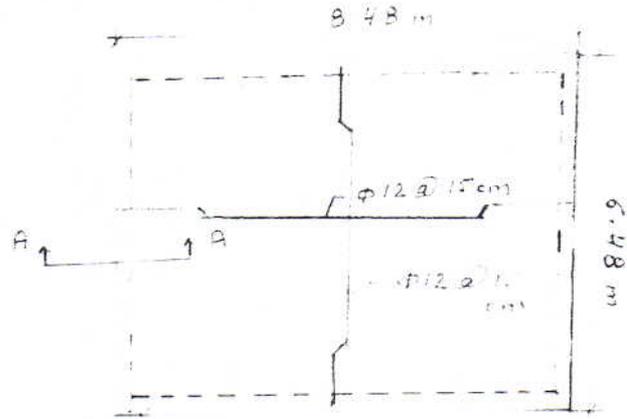
250 mm
 150 mm
 250 mm
 Foundations
 150 mm wide
 250 mm high

750 mm

1050 mm

Plastering with
 Cement mortar 5 mm
 Water proof 20 mm

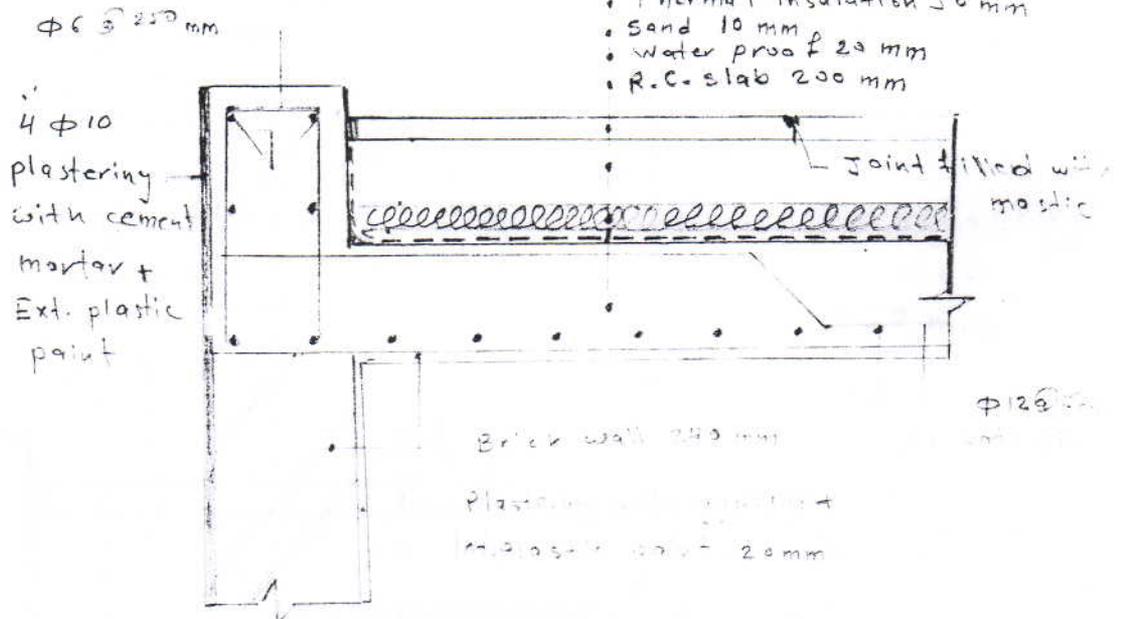
Q2/



Top view

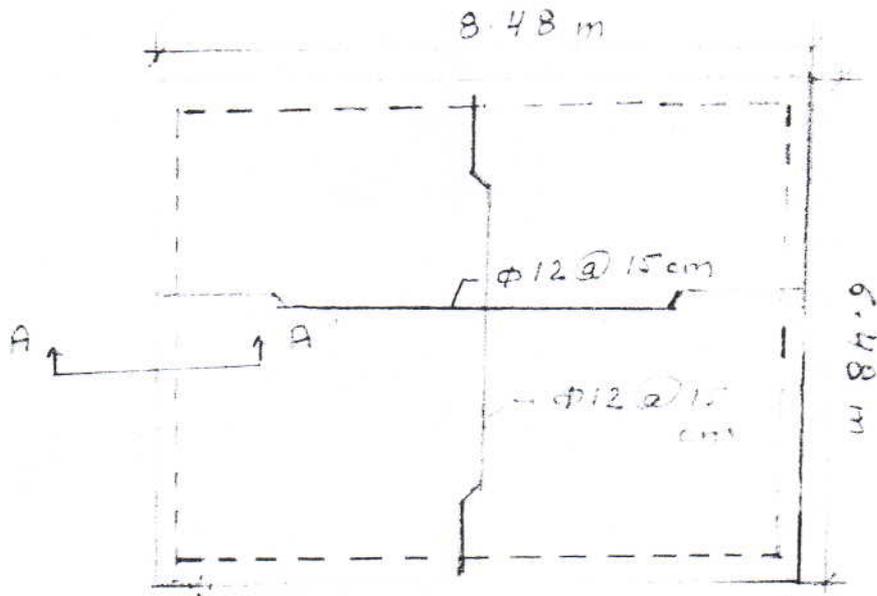
scale: 1:100

- Precast concrete tiles $800 \times 800 \times 40$ mm
- Sand according to spec
- Thermal insulation 50 mm
- Sand 10 mm
- Water proof 20 mm
- R.C. slab 200 mm



Section A-A

Q2/



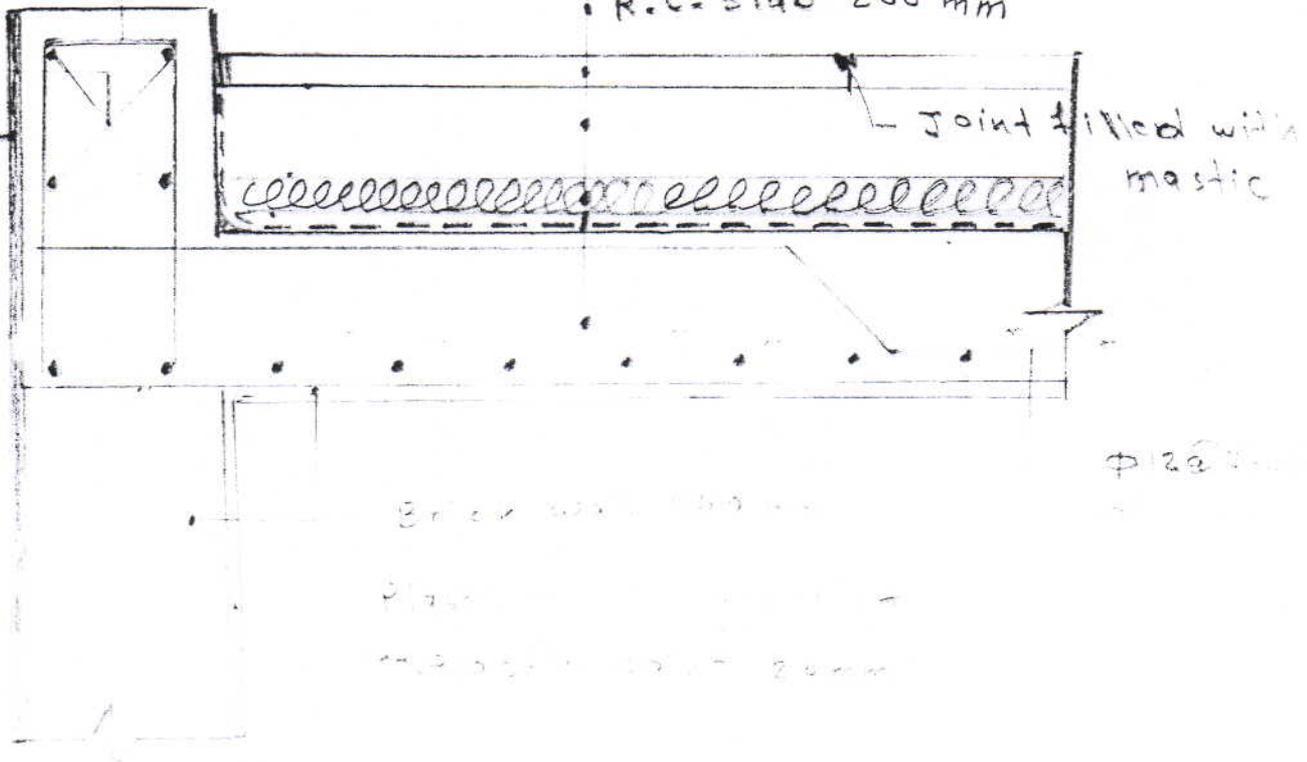
Top view

Scale: 1:100

- Precast concrete tiles 800 × 800 × 40 mm
- Sand according to slope
- Thermal insulation 50 mm
- Sand 10 mm
- Water proof 20 mm
- R.C. slab 200 mm

φ 6 @ 250 mm

φ 10
restering
with cement
mortar +
xt. plastic
sheet



φ 12 @ 150 mm

Brick wall 200 mm
Plaster
200 mm

Q3/

- a. The objectives of using steel frame are :
- High compressive & tensile strength, that means the required cross sectional area of steel sections is smaller than the required cross sectional area of other materials, so reduce applied loads on the foundation and offered more areas and spaces.
 - Steel frames installed in a short time compared with other materials.
- b. The objectives of using lintels are their easy to build and the supporting walls need not be very strong.
- c. Pin vibrators are one of the procedures to compact concrete which are useful for the followings:
- Decrease w/c ratio and it means more strength and low shrinkage
 - Can compact the concrete with high thickness
 - More dense of concrete and low voids and it means good quality and low permeability of concrete
 - More penetration of concrete between bars and good shape
 - Ability to use mixes with low workability and this mean high strength
 - Decrease the time to remove side forms and this is very important for production of tiles and blocks
- d. Precast concrete piles are used whereas for heavy loads and for driven through harder soils 1:1½:3 mix is employed.
- e. All buildings need refilling to refill for example sides of foundations, trenches and floor to reach proper level.

Q4/

Properties of bricks:

Hardness: This is somewhat vague term very commonly used to description of bricks. By general agreement it is recognized that the brick which is to have a moderately good compressive strength, reasonable resistance to saturation by rain water and sufficient resistance to the disruptive action of frost should be hard burned. A method of testing for hardness is to hold the brick in one hand and give it a light tap with a hammer. The sound cause by the blow should be a dull ringing tone thud.

Compressive strength; this is only property of bricks which can be determined accurately.

Absorption: A wall built of very hard bricks which absorb little water may well be more readily penetrated by rain water than one built of bricks which absorb a lot of water. This is because rain will more easily penetrate a small crack in the mortar between bricks if the bricks are dense than if the bricks around the mortar are absorptive.

Frost resistance: A very few failures of brickwork due to the disruptive action of frost have been reported during the last years. The few failures reported were in exposed parapet, walls chimney stacks, where bricks suffer most rain saturation and there is a likelihood of damage by frost. Parapet walls, chimney stacks and garden walls should be built of sound, hard burned bricks protected with coping, capping and damp proof courses.

Efflorescence: Clay bricks contain soluble salts that migrate, in solution in water, to the surface of brickwork as water evaporates to the outside air. These salts will be collect on the face of brickwork as efflorescence of white crystals that appear in irregular, usually patches.

The properties of stones:

The proprieties of stones which are important for stone masonry are strength and durability. Economy and appearance are additional requirements. The main considerations for durability are the lasting qualities of the stone itself and the locality where it is to be used. Porous stones are unsuitable for areas prone to heavy rainfall and frost. Stones, e.g. marbles having low porosity and low coefficients of expansion and contraction should be used in areas subjected to large variations in rainfall and temperatures.

Generally lime and cement mortars are used for stone masonry. Their function is to provide a workable matrix and ultimately a hard building material, which renders masonry into a monolithic unit.

Q5/

Ribbed slab:

Ribbed slab floors consist of a number of small beams spaced closely and cast monolithically with the slab. In the ordinary slab, the area of concrete below the neutral axis of the section does not contribute to the increase in strength of the section. Its object only to hold the reinforcement in position. Generally ribs are not less than 10cm width. The slab between the ribs is 5 to 10 cm in thickness and is reinforced with wire mesh or with bars of small diameter running perpendicular to the ribs.

The cost of such ribbed slabs is very high due to intricate formwork needed for their construction. Hence the sides of the joists and the bottom of the slab are cast by placing hollow clay tiles, hollow gypsum tiles or sheet steel cores. Wooden form work is built for the bottom of the ribs and slightly wider than the width of the ribs so that the tiles can rest on it.

Kinds of concrete masonry units

There are several kinds of concrete masonry units depending on the shapes and sizes in which they are manufactured. However two distinct types of concrete masonry units are:

1. Regular concrete blocks: these are precast cement concrete blocks made from dense aggregates and intended for load bearing walls.
2. Light weight concrete units: Light weight aggregates are used in the construction of these units and although they are not as strong as the heavy concrete blocks, yet they are extensively used for both load bearing and non-load bearing walls. This situations where they are used for load bearing walls are external walls rendered or otherwise protected, the inner leaf of cavity walls, backing for brick work and stone masonry, internal load bearing walls and partitions and in filling panels for framed buildings. As non load bearing units, they are used in partitions and in filling panels for framed buildings.