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National Institute of Technology Hamirpur (H.P)
Department of Civil Engineering
B. Tech Second Year
IV Semester
Sessional Examination: 2022-23
End Semester Theory Examination
CE - 224 Building Materials and Construction

Duration: 3 Hours **Max marks: 100**

Instructions:

- Missing data, if any, may be assumed and stated suitably.
- Calculator is allowed.

1. Design the isolated stepped footing for a brick-pillar of 30 cm x 30 cm, carrying a super-imposed load of 250 kN at its top. The height of the column above plinth level is 3 m. The difference between plinth level and ground level is 0.5 m. The brick masonry weighs 19.5 kN/m^3 while the lime concrete to be used in the base weighs 21 kN/m^3. The soil has angle of repose of 30°, unit weight of 17 kN/m^3 and safe bearing capacity of 160 kN/m^2. The foundation concrete has a modulus of rupture equal to 150 kN/m^2. Sketch the foundation section. **(20)**

2. Design a suitable staircase for a hospital which consists of ground floor and first floor. It is also intended to provide a provision (space) for lift for future construction.
The details are:
Staircase room size = 6.0 m x 4.3 m
Height of each floor = 3.5 m
Thickness of floor slab = 15 cm
Width of stair = 140 cm
Draw the plan view of the staircase. **(20)**

3. Write short notes on the following: **(5 x 7 = 35)**

    (1) How drainage of flat roofs is made?
    (2) Discuss general fire safety requirement of a building.
    (3) Explain with sketches different types of pointing.
    (4) Draw plan views of alternate course of (i) 1.5 brick thick wall and (ii) 2 brick thick wall in English bond.
    (5) Explain the procedure of proportioning a trapezoidal combined footing for two columns carrying unequal loads if the distance between the columns is given.
    (6) Discuss the required adjustments of the quantity of water, fine aggregate and coarse aggregates in a mix concrete design when the aggregates are in dry conditions.
    (7) Discuss different methods of seasoning of timber.

4. A sample of damp aggregate weighing 2.35 kg is dried by hair dryer until it just reaches the free running (saturated surface dry) condition. It is then found to weigh 2.24 kg. After drying in the oven at 110°C to constant mass, it is found to weigh 2.15 kg. Based on dry mass, calculate (i) the percentage of free-water content and (ii) the percentage of total water content. **(10)**

5. A 20 cm thick brick wall carries an axial load of 50 kN/m from wall above it and an eccentric load of 80 kN/m from RCC floor slab acting at a distance of 7.5 cm from the centre of wall. Determine the equivalent eccentricity and stresses in the wall. **(15)**