

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)**

CLASS: BE
BRANCH: CIVIL

SEMESTER: V
SESSION : MO/2019

SUBJECT : CE5005 STRUCTURAL DESIGN - II

TIME: 1.5 HOURS

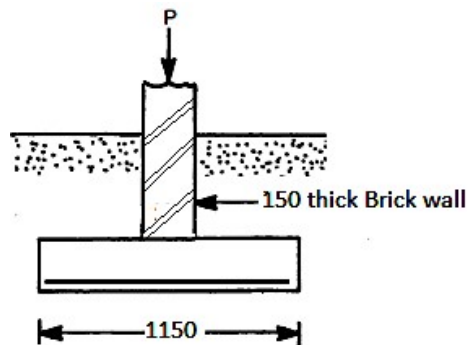
FULL MARKS: 25

INSTRUCTIONS:

1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 A tapered cantilever beam of span 3 m, having a section of 300mm depth and 350mm width at the free end, and 700 mm depth and 350 mm width at the support is provided with longitudinal 5-25mm diameter tension reinforcement with 3 -25 mm diameter being curtailed at a distance of 2m from fixed support. 2-25mm diameter bars has been provided as compression reinforcement. The beam must support factored uniform load of 105 kN/m, including self-weight. Assume an effective cover of 45 mm, Fe 415 steel and M 20 concrete. Design shear reinforcement at 1 m from the free end. [5]

Q2 A reinforced concrete footing has a width of 1.15 m and supports a 150 mm thick wall. Verify and comment on the anchorage of main bars 12mm in diameter if they are stressed fully. Assume M20 concrete and Fe 415 grade steel. Assume side cover to the reinforcement as 50mm. [5]



Q3 Find the ultimate moment capacity of a reinforced concrete trapezoidal section. The beam has a top width of 400 mm, depth of 550 mm and width at the level of centroid of reinforcement as 250 mm. Tension reinforcement provided is 1473 mm². Assume $f_{ck} = 20$ MPa and $f_y = 415$ MPa. [5]

Q4 A cycle stand shade consists of an R.C slab which cantilevers 2m on each side of central beam. The R.C beam is simply supported on columns 230mm x 450mm at ends, over a clear span of 6m. Design the longitudinal reinforcement of beam if live load of 2kN/m² is expected to act on R.C shade slab. Assume dead load contribution from slab to beam as 20kN/m. Assume M20 grade concrete and Fe415 steel. [5]

Q5 Explain the process of hydration of cement. [5]

Q6 (a) Which shape of aggregate is considered the best for making concrete? Why? [2]
(b) A singly reinforced R.C.C beam is subjected to a moment of 40kN-m. The width of the beam is 200mm. Calculate the depth of beam and area of steel reinforcement required for balance design. Use M20 grade concrete and Fe415 steel. [3]