(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2450 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

ADVANCED CONCRETE DESIGN

Time : 3 Hours *Total Marks : 100*

Note :— (1) Attempt **ALL** the problems.

(2) IS-456 and IS-3370 is permitted.

(3) Assume any suitable data, if missing.

(4) Show the structural details of design problems.

1. Attempt any **two** of the following : **(2×10=20)**

(a) Design a circular water tank with flexible base resting on the ground to store 60,000 litres of water. The overall depth of tank may be kept 4·5 m. Use M25 grade concrete and Fe-415 steel.

(b) Design the long wall of a rectangular water tank of size 6 m × 4 m × 3 m deep resting on firm ground. Use M25 grade concrete and Mild steel.

(c) Design support section of a circular R.C. girder for the foundation raft of a water tower has a mean diameter of 10 m. The u.d.l. transmitted by eight symmetrically placed columns on the girder being 300 kN/m. The width of the beam is 500 mm and overall depth is 1000 mm. Use M20 grade concrete and Fe-415 steel.

Constants :

Negative bending moment at support $k_1 = 0{\cdot}0083$

Positive bending moment at centre of span $k_2 = 0{\cdot}0041$

Maximum twisting moment or torque $k_3 = 0{\cdot}006$ (at 9·5° from either support).

2. Attempt any **one** of the following : **(1×20=20)**

(a) Design the columns and braces of a tower of 16 m height to support the intz tank as shown in Fig. 1. Assume the wind pressure is 1·5 kN/m². Vertical load on each column is 1500 kN. Tank is supported on 8 equally spaced columns. Density of concrete is 25 kN/m². Use M20 grade concrete and Fe-415 steel.

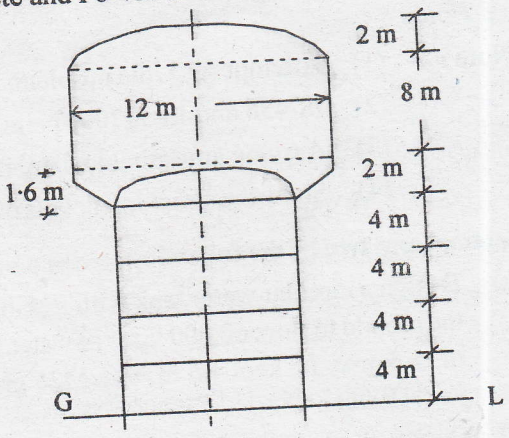

Fig. 1

(b) Design the foundation of an intz type water tank. Support on an elevated tower comprising of 8 columns. The mean dia of circular girder is 10 m. The load transmitting by each column is 2200 kN. The safe bearing capacity of soil at site is 250 kN/m². Use M20 grade concrete and Fe-415 steel.

Use the coefficient came as mentioned in problem 1(c).

3. Attempt any **one** of the following : **(1×20=20)**

(a) The substitute frame shown in Fig. 2 has to be analysed for maximum positive and negative moments in the beam AB and BC. Use the following data to estimate the maximum moments in beams and columns. The beams are spaced at 3·0 m intervals.

Thickness of floor = 100 mm, Live load = 2 kN/m², Floor finish = 0·6 kN/m², Size of beam = 200 × 400 mm, Size of column = 200 × 400 mm.

Density of concrete = 25 kN/m³.

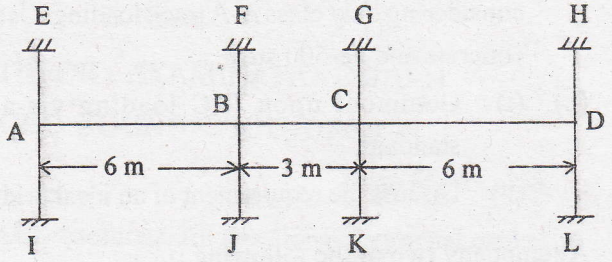

Fig. 2

(b) Analyse the multistorey frame shown in Fig. 3 for moments in the ground floor columns IM, JN, KO and LP and the beams IJ, JK and KL. Adopt the following data : Length of beam = 6 m, Height of coloumn = 3 m, Wind loads are H_1 = 6 kN, H_2 = 12 kN, H_3 = 12 kN. The column have the same cross-section. Compare the results of the portal and cantilever methods of analysis.

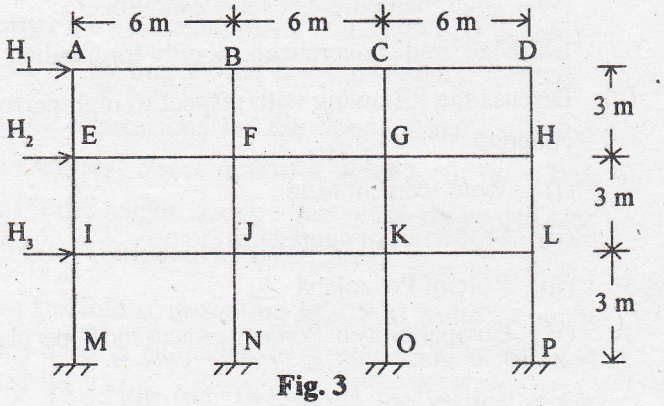

Fig. 3

4. Attempt any **one** of the following : **(1×20=20)**

(a) A RCC T beam bridge is to be built for a span (effective) of 25 m. Show the arrangement of assumed longitudinal girders and cross beams. Design any slab panel considering only class A-A track loading. Use M30 grade concrete and Fe-500 steel.

(b) (i) Comment upon IRC loading vis-a-vis world standard. 8

(ii) Discuss the requirement of an ideal bridge site. 12

5. Attempt any **two** of the following : **(2×10=20)**

(a) Discuss the different types of shear connectors used for composite construction.

(b) Design a beam of composite construction to the following requirements :

(i) Flange width provided by slab = 1500 mm

(ii) Thickness of the slab = 100 mm

(iii) Prefabricated unit shall be a steel beam section

(iv) Span of beam = 12 meters

(v) Total load on the beam = 24 kN/m.

Use M20 grade concrete check only for bending stress.

(c) Discuss the following with respect to high performance concrete :

(i) Water-cement ratio

(ii) Properties of aggregates

(iii) Role of Pozzolana

(iv) Compatibility of Portland cement and Super plasticizer.

4×2½=10