Question Paper 2012

Civil Engineering

(Paper II)

(Civil and Structural)

1. (*a*) What are the chief chemical ingredients and their percentage used in the manufacturing of Portland cement? Also briefly explain the Bogue components and their properties in the cement. (20)

(*b*) Explain ***any four*** of the following thermal insulation : ($5 \times 4 = 20$)

(*i*) Slab or block insulation

(*ii*)Blanket insulation

(*iii*)Bat insulating materials

(*iv*)Insulating boards

(*c*) Explain Whole Circle Bearing system. The following bearings were observed with a compass. Calculate the interior angles. (20)

LINE	FORE BEARINGS
AB	60° 30′
BC	122° 00′
CD	46° 00′
DE	205° 30′
EA	300° 00′

2. (*a*) What is superelevation? Derive the relation between superelevation and speed of vehicle on horizontal curve. Design the rate of superelevation for a horizontal curve of a radius 500 m and speed 100 km/hr. (5 + 15)

(*b*) Describe the terms – True and Magnetic bearings; local attraction; back bearings and magnetic declination. (20)

(*c*) Explain the term Base period and Crop period. After how many days will you order irrigation in order to ensure healthy growth of crops if : (20)

(*i*) Field capacity of soil = 29%

(*ii*)Permanent wilting point = 11%

(*iii*)Density of soil = 1300 kg/m^3

(*iv*)Effective depth of root zone = 700 mm

(*v*) Daily consumptive use of water of the given crop = 12 mm

Consider moisture content must not be less than 25% of the water holding capacity between the field capacity and permanent wilting point.

3. (*a*) What do you mean by "Viscosity" ? Velocity distribution of a fluid of dynamic viscosity is 8.63 poise is $U = 2/3y - y^2$ in which U is the velocity in m/sec at a distance y meter above the plate, determine the shear stress at y = 0 and y = 0.15. Take dynamic viscosity of fluid is 8.63 poise. (20)

(*b*) Define air pollution. Enlist natural and man made air pollution. What are the effects of air pollution on human, plants and materials? (5 + 5 + 10 = 20)

(*c*) Define the term BOD, COD and TDS. The 5 days 30°C BOD of sewage sample is 110 mg/l. Calculate its 5 days 20°C BOD. Assume the deoxygenation constant at 20°C k_{20} as 0.1? ($3 \times 3 + 11 = 20$)

4. (*a*) Two plates 6 mm thick are joined by 14 mm diameter rivets in a triple staggered riveted lap joint as shown in fig 1. In what way will the joint fail if allowable tensile stress for plate = 150 MPa; allowable shear stresses for rivets = 90 MPa and allowable bearing stress for rivets = 270 MPa. Also find the efficiency of the joint. (20)

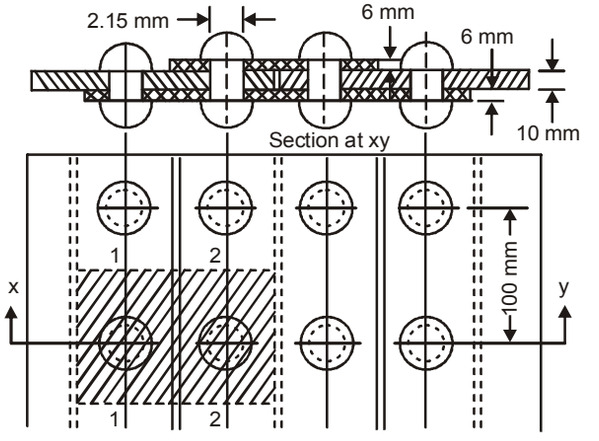

Fig. 1

(*b*) A sand deposit is 10 m thick and overlies a bed of soft clay. The ground water table is 3m below the surface. If the sand above the ground water table has a degree of saturation of 45%, plot the diagram showing the variation of the total stress, pore water pressure and the effective stress. The void of the sand is 0.70. Take G = 2.65. (20)

(*c*) Draw the shear force and bending moment diagrams for the beam shown in fig. 2 (20)

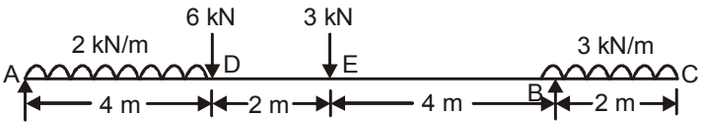

Fig. 2

5. (*a*) The cross - section of a joist as a T-section, 120 mm × 200 mm × 12 mm, with 120 mm side horizontal. Sketch the shear stress distribution and hence find the maximum shear stress if it has to resist a shear force of 200 kN. (25)

(*b*) For the I section shown in fig. : 3 determine the position of centroid and moment of inertia about the base flange (I_{KL}).

(10 + 10 = 20)

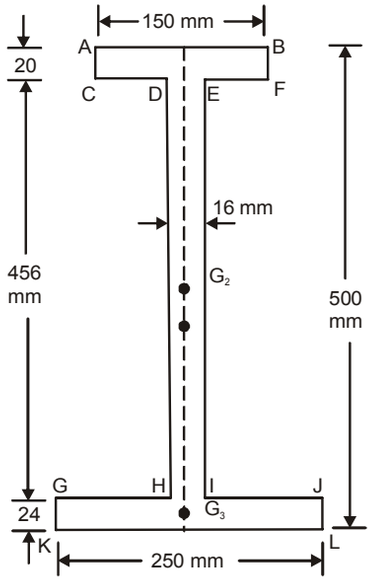

Fig. 3

(*c*) (*i*) What is bond? Explain flexural and anchorage bond. (6)

(*ii*) What is development length? Write its significance in RCC design.

(4 + 5 = 9)

6. (*a*) A singly reinforced beam having a width of 250 mm is reinforced with 3 bars of 16 mm diameter at an effective depth of 400 mm. If M20 grade concrete and Fe415 HYSD bars are used, compute for the section.

(15 + 15)

(*i*) Working moment of resistance

(*ii*)Ultimate moment of resistance

(*b*) Design a square column section subjected to concentrated load of 1000 kN at service. Consider concrete grade of M25 and steel grade Fe 415. (10)

(*c*) Design a built - up column composed of two channel sections placed back to back, carrying an axial load of 1345 kN. Effective length of column is 4.95 m. Take f_y = 250 kN/mm^2.

(20)