Total No of Questions: [08] *SEAT NO. :*

[Total No. of Pages : 03]

S. E Civil 2012 Course, Examination May 2014

STRUCTURAL ANALYSIS I

(Semester -II)

Time: 02 Hours ***Max. Marks :50***

Instructions to the candidates:

1. Attempt **Q. 1** or **Q. 2**, **Q. 3** or **Q. 4**, **Q. 5** or **Q. 6**, **and Q. 7 or Q.8.**
2. Answer should be written in one answer book.
3. Neat diagram must be drawn wherever necessary.
4. Figure to the right indicates full marks.
5. Assume suitable data, if necessary and clearly state.
6. Use of cell phone is prohibited in the examination hall.
7. Use of electronic pocket calculator is allowed.

Q1) a) Define static and kinematic indeterminacy of the structures. Find static and kinematic indeterminacy of simply supported and fixed beam. [06]

b) Determine reaction V_B at B for the propped cantilever loaded and supported as shown in **Fig. 1 b** by Castigliano's second theorem. [06]

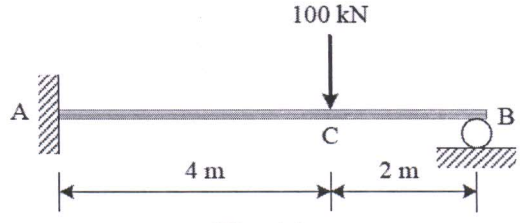

Fig. 1 b

OR

Q2) a) Derive a general expression to find slope and deflection of a simply supported beam of span L subjected to central point load W by Macaulay's method. [06]

b) Determine horizontal reaction H_A at A using Castigliano's second theorem for a portal frame ABCD loaded and supported as shown in **Fig. 2 b**. [06]

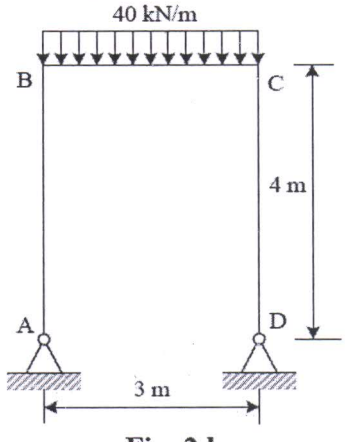

Fig. 2 b

Q3) a) Determine the horizontal displacement of the joint C of the pin jointed frame as shown in **Fig. 3 a**. The cross sectional area of AB is 500 mm^2 and of AC & BC is 750 mm^2. Assume E = 200 kN/mm^2. [06]

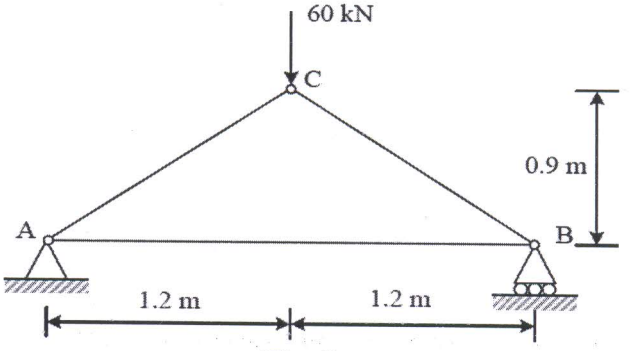

Fig. 3 a

b) A uniformly distributed load of 100 kN/m and 6 m long moves over a girder of 40 m span from left to right. Using influence lines, find shear force and bending moment at a section 12 m from the left support when the tail of the load is 10 m from the left hand support. [06]

OR

Q4) a) A pin jointed rectangular frame with two diagonal is built up as shown in **Fig. 4 a**. The bar AD is the last to be added and is short by 2 mm. Find the force in AD when it is forced into position. The sectional area of each side bars is 2000 mm^2 and of each diagonal is 1000 mm^2. Take E = 200 GPa. [06]

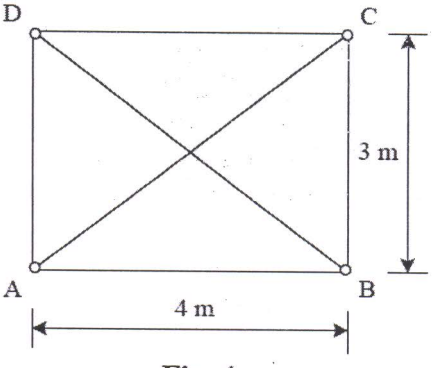

Fig. 4 a

b) A warren girder of 25 m span is made up of five panels of 5 m each. The diagonals are inclined at 60^0 to the horizontal. Draw the influence line for force in the lower chord member L_1L_2 and find axial force in member $L_1L_2$for a uniformly distributed moving load 20 kN/m longer than the span. Refer **Fig. 4b**. [06]

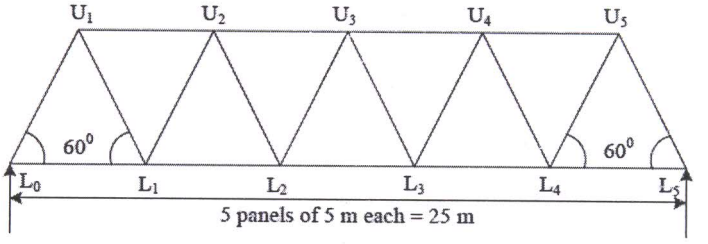

Fig. 4 b

Q5) a) A three hinged parabolic arch of 20 m span and 4 m central rise carries a point load of 150 kN at 4 m horizontally from the left hand hinge. Calculate the normal thrust and shear force at the section under the point load. [06]

b) A parabolic arch is hinged at the springing, which are at the same level. The span is 48 m with a central rise of 6 m. it carries a point load of 160 kN at the crown. If $I = Io \sec \theta$, calculate the normal thrust, radial shear and bending moment at the left hand quarter span. [07]

OR

Q6) a) In a three hinged circular arch, the span is 40 m and the rise is 5 m. It carries a uniformly distributed load of 15 kN per horizontal meter run over the entire span and point loads of 100, 150 and 200 kN at horizontal distance of 15, 20 and 25 m from the left hand hinge respectively. Calculate the horizontal thrust and the reactions at the hinges. [06]

b) A semicircular arch ACB of uniform section and radius r is hinged at the ends A and B are at the same level. It carries a point load W at the crown C. Show that the horizontal thrust at the abutment is W/π. [07]

Q7) a) Explain in details, true and idealized stress-strain curve for mild steel in tension. [06]

b) Find out the collapse load for a propped cantilever subjected to uniformly distributed load w/unit length. [07]

OR

Q8) a) State and explain upper bond, lower bond and uniqueness theorem. [06]

b) Determine the fully plastic moment in the portal frame as shown in **Fig. 8 b**. The frame has a uniform cross section throughout. [07]

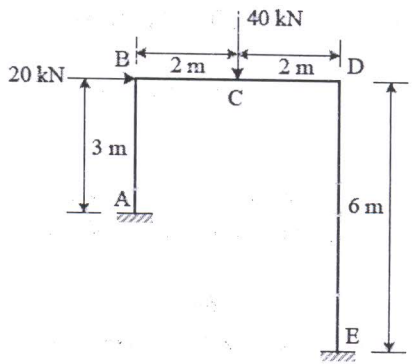

Fig. 8 b