Printed Pages : 3 **Roll No.** | | | | | | | | | | | **NCE401**

B.TECH.

THEORY EXAMINATION (SEM–IV) 2016-17

STRUCTURAL ANALYSIS-I

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

SECTION – A

1. Attempt the following: **10 x 2 = 20**

(a) Give an example of a structure where it is externally as well as internally indeterminate?

(b) Which method of analysis is suitable, if static indeterminacy is more than kinematic indeterminacy?

(c) What are the uses of influence lines?

(d) Distinguish between influence line diagram and bending moment diagram.

(e) Classify the arches based on materials, shapes and structural systems?

(f) Why arches are preferred than beams?

(g) Write the formulae for area the centroid of the curve defined by $y = kx^n$.

(h) What is the advantage of conjugate beam method over other method?

(i) State Castigliano's first theorem?

(j) Write the equation in term of strain energy, which is sufficient to determine the stress in case of propped cantilever beams?

SECTION – B

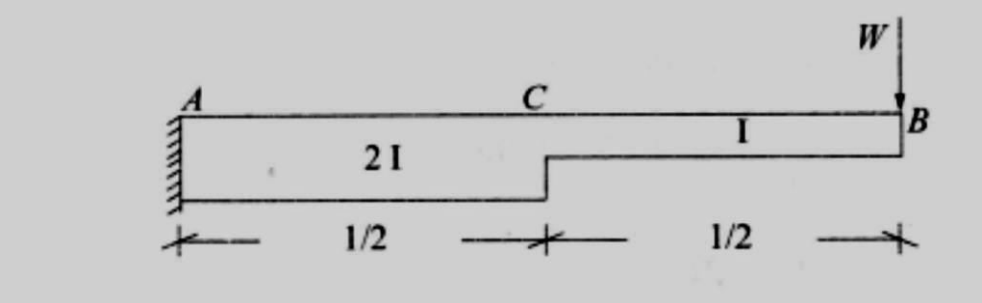
2. Attempt any five parts of the following questions: **5 x 10 = 50**

(a) A simply supported beam has a span of 25m.Draw the influence line for shearing force at a section 10m from one end and using this diagram determine the maximum shearing force due to the passage of a point load 5kN followed immediately by uniformly distributed load of $2.4kN/m^2$ extending over a length of 5m?

(b) An uniformly distributed load of 40kN/m and of length 3 metres transverse across the span of simply supported length of 18 metres. Compute the maximum bending moment at 4m from the left support and absolute bending moment.

(c) A three hinged parabolic arch hinged at the supports and at the crown has a span of 24m and a central rise of 4m. It carries concentrated load of 50kN at 18m from the left support and udl of 30kN/m over the left portion. Determine the normal thrust, radial shear at a section 6 metre from the left hand support.

(d) Find the slope and deflection at the free end of a cantilever shown in figure by moment area method. Moment area of AC is twice the inertia of BC.



(e) A beam ABCDE is 12m long and supports a load of 100kN at C, simply supported at A and E. Portions AB=BC=CD=DE=3M.Moment of inertia is I in the portion AB and DE

and 2I in the portion BD. Determine the deflections at B and C by using conjugate beam method.

(f) A cantilever beam is of span 2m and is subjected to a concentrated load of 20kN at the free end. The cross section of the beam is 100 x 200mm and E=30kN/mm^2.Calculate the slope and deflection of the beam at midspan. Use unit load method.

(g) State and prove that the Castigliano's theorem.

(h) (i) Define fatigue

(ii) What is the polar moment of inertia?

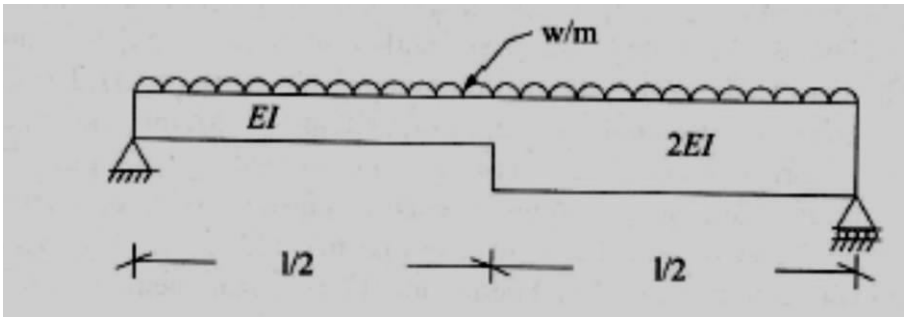
(iii) What is unsymmetrical bending?

(iv) What are the reasons for unsymmetrical bending occurring in the beams?

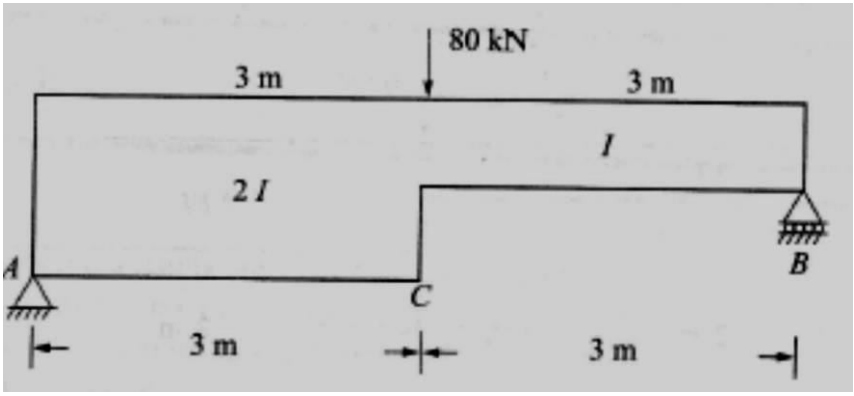
SECTION – C

Attempt any two of the following questions: 2 x 15 = 30

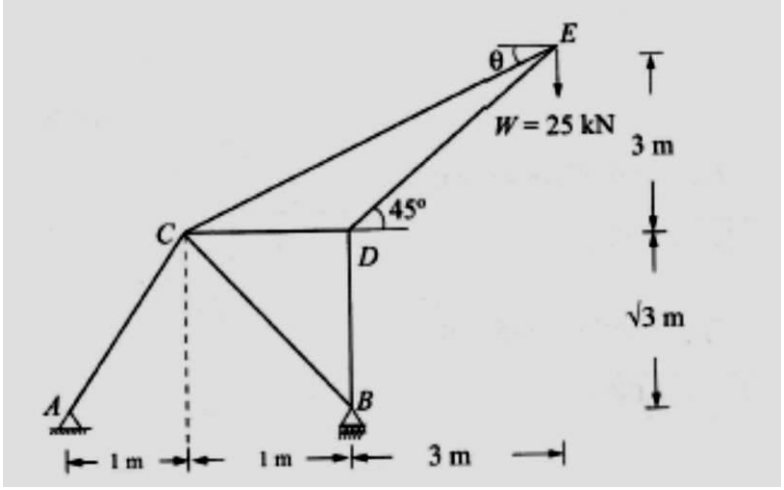
3. (a) A simply supported beam with variable moment of inertia supports a uniformly distributed load of w kN/m. Estimate the maximum deflection in a beam.



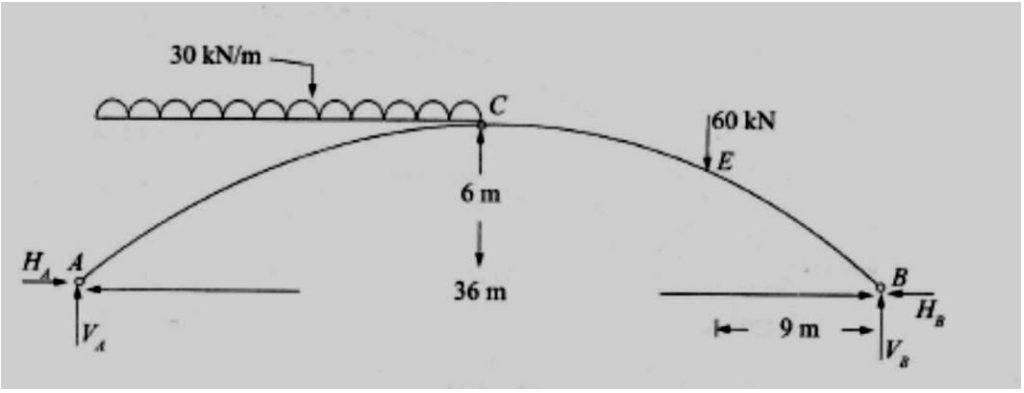
(b) Determine the slopes at supports and deflection under the load for the beam shown in figure. Take young's modulus E as 210GPa, moment of inertia as 120 x 10^6 mm^4.Adopt conjugate beam method.



4. (a) Calculate the deflection under the load for truss shown in figure. All the members are have equal areas of 1250mm^2 in cross-section and E=200kNm^2.



(b) A three hinged parabolic arch is shown in figure. Determine the normal thrust, radial shear and bending moment at quarter span and draw BMD.



5. Figure shows a frame subjected to a load of 3.4kN.find the resultant stress at A and B.