

Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(CE)/SEM-5/CE-504/2011-12

2011

STRUCTURAL ANALYSIS-II

Time Allotted : 3 Hours

Full Marks : 70

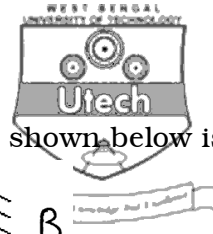
The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

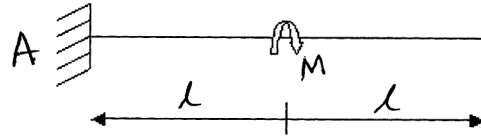
GROUP – A

(Multiple Choice Type Questions)

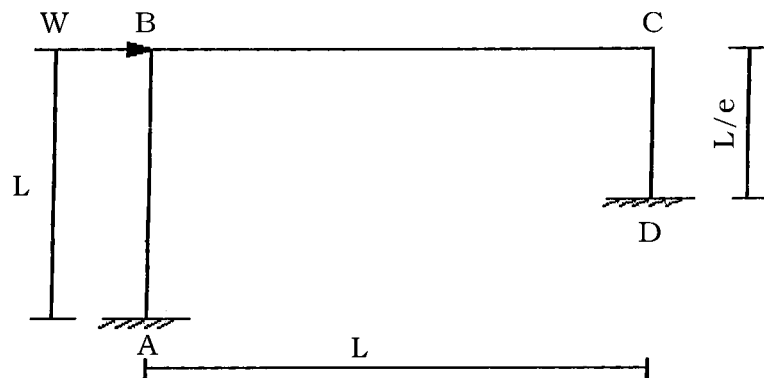
1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$
- i) A three hinged arch is
 - a) determinate if the springing are at the same level
 - b) statically indeterminate because of central hinge
 - c) statically determinate
 - d) statically determinate or indeterminate depending upon loading.
 - ii) In a cable subjected to U.D.I the tension in the cable is
 - a) maximum at the centre
 - b) uniform throughout
 - c) maximum at the supporting towers
 - d) not predictable.
 - iii) A uniform simply supported beam is subjected to a clockwise moment M at the left end. The moment required at the right end of the beam so that the rotation of right end is zero is equal to
 - a) $2M$
 - b) M
 - c) $M/2$
 - d) $M/3$.



- iv) The fixed end moment M_{FAB} for the beam shown below is



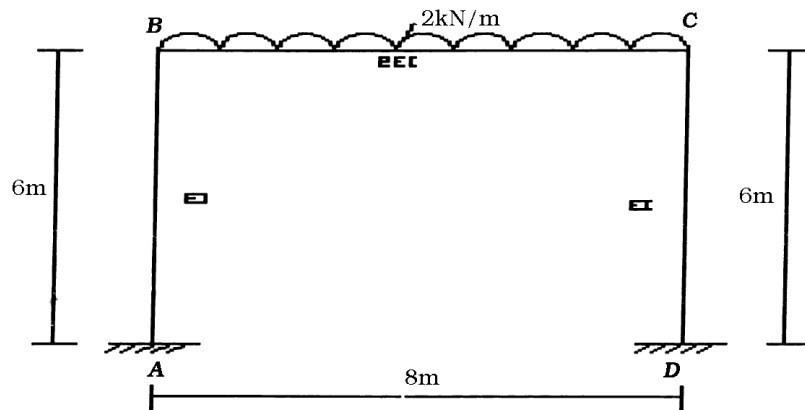
- a) zero b) $M/2$
 c) $M/3$ d) $M/8$.
- v) If a moment, M is applied to the hinged end of a prismatic propped cantilever, then the moment at the fixed end will be
 a) M b) $M/2$
 c) $M/4$ d) none of these.
- vi) State which of the following statements is true.
 a) The moment distribution method essentially attempts to solve the simultaneous equations of the equilibrium method
 b) The carryover factor for the prismatic beam is one
 c) The carryover factor cannot be one
 d) The modified stiffness of a prismatic member is $3EI/L$.
- vii) A portal frame with all the members having the same EI , has one end fixed and the other hinged. Due to side sway, the ratio of fixed end moments M_{BA}/M_{CD} would be
 a) 1 : 1 b) 1 : 2
 c) 1 : 3 d) 2 : 1.





viii) For the frame as shown in the figure below, the distribution factors for members BC & BA at joint B are

- a) 0.4, 0.6 b) 0.5, 0.5
c) 0.6, 0.4 d) 0.7, 0.3.



ix) The slope-deflection method in structural analysis falls in the category of

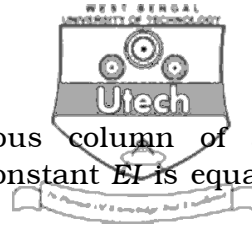
- a) force method
b) flexibility method
c) consistent deformation method
d) stiffness method.

x) A beam AB (Span = l ; flexural rigidity = EI) is fixed at A and simply supported at B . If the support B settles by Δ , the moment induced at B is equal to

- a) $\frac{6EI\Delta}{l^2}$ b) $\frac{3EI\Delta}{l^2}$
c) $\frac{2EI\Delta}{l^2}$ d) zero
e) $\frac{4EI\Delta}{l^2}$.

xi) A cable can resist

- a) axial thrust b) shear force
c) torsion d) tension.



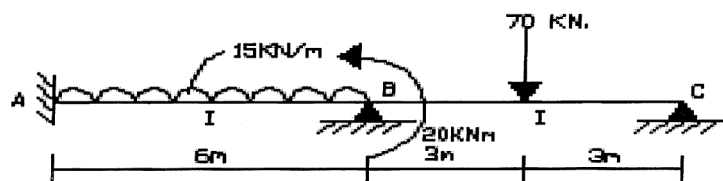
- xii) The moment of inertia of analogous column of a propped cantilever of length L and constant EI is equal to
- a) $L^3/3EI$ b) $L^3/4EI$
 c) $L^3/12EI$ d) $L^3/48EI$.
- xiii) If the sag of the cable suspended between two points decreases, then horizontal component of tension will
- a) increase b) decrease
 c) remain same d) zero.
- xiv) Parabolic two-hinged arch having supports at same level having span l and rise h , every section is subjected to only
- a) bending moment b) normal thrust
 c) shear force d) none of these.

GROUP – B

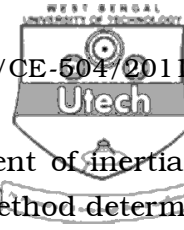
(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

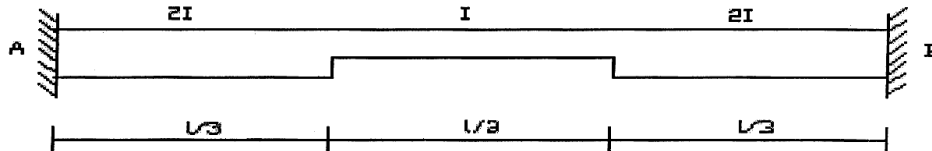
2. Find out the final moments of the continuous beam as shown in the figure by Moment Distribution Method. ($EI = 180 \text{ KNm}^2$)



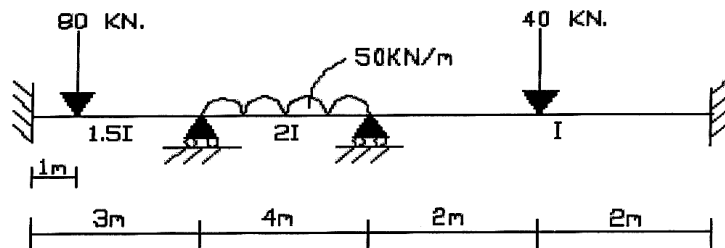
3. A two hinged parabolic arch has a span of 20m and a central rise of 2m. Draw influence lines for the followings :
- i) horizontal thrust
- ii) B. M., normal thrust & radial shear at a section 5m from the left end.



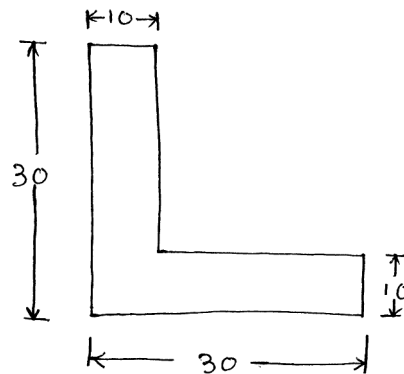
4. A beam fixed at the ends has varying moment of inertia as shown in the figure using Column Analogy Method determine the fixed end moments.



5. Analysis the given continuous beam by Kani's method. (Figure given)



6. Determine the centroidal principal moment of inertia of the equal angle section $30 \times 30 \times 10$ mm as shown in the Figure.



7. a) Write down the definition of the term stiffness and describe it.
b) What is distribution factor ? Explain with an example.



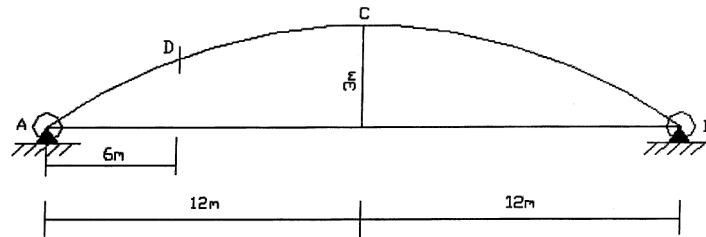
GROUP – C

(Long Answer Type Questions)

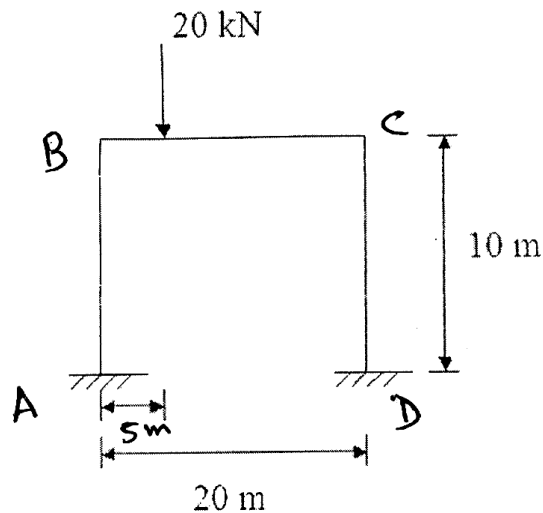
Answer any *three* of the following.

$3 \times 15 = 45$

8. Draw influence line diagrams for horizontal thrust, B.M, shear & thrust at *D* of the parabolic arch as given in the figure (consider $I_x = I_0 \sec \theta$).



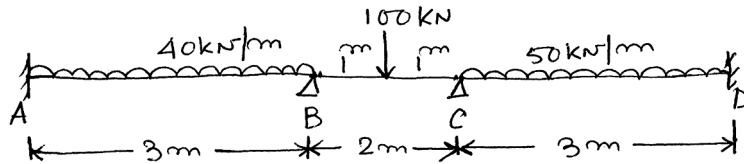
9. Find out the following ILD for cable with 3 hinged stiffening girder :
- ILD for horizontal force
 - ILD for moment at distance 'x' from any end
 - ILD for udl 'w' per metre run.
10. Analyse with sway the portal frame show below by Kani's method. Take *I* is constant throughout the frame.



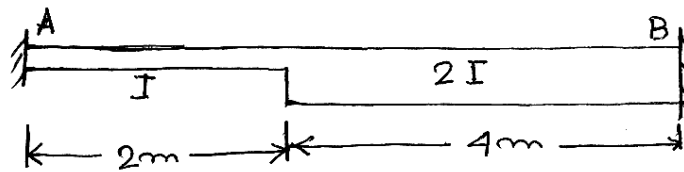


11. Determine the support moments for the continuous girder shown in the figure by 'slope deflection method', if the support B sinks by 2.5mm .

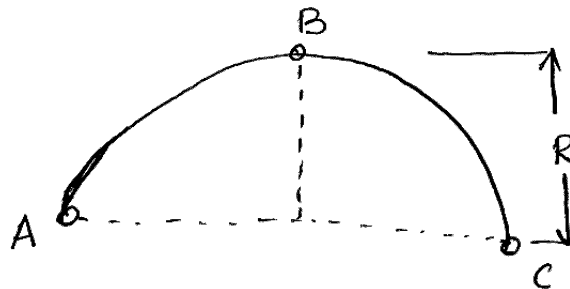
For all members $I = 3.50 \times 10^7 \text{ mm}^4$, $E = 200 \text{ KN/mm}^2$.

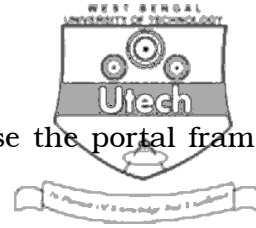


12. a) Determine the stiffness and carry-over factor for the beam as shown in the figure .



- b) A semicircular beam ABC is supported on three equally spaced support A , B and C as shown in the figure below. Considering w to be the load per unit length of the beam. Find out Maximum bending moment and Twisting moment.





13. Using the Column Analogy Method analyse the portal frame as shown in the figure given below.

