

(3 Hours)

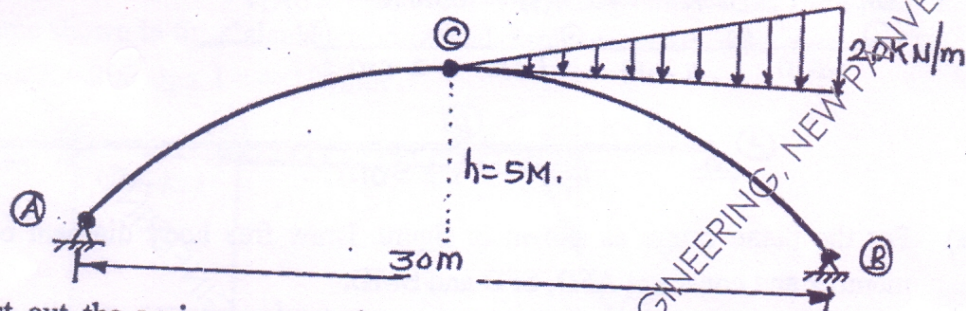
[Total Marks: 80

N.B: (1) Question No. 1 is compulsory.

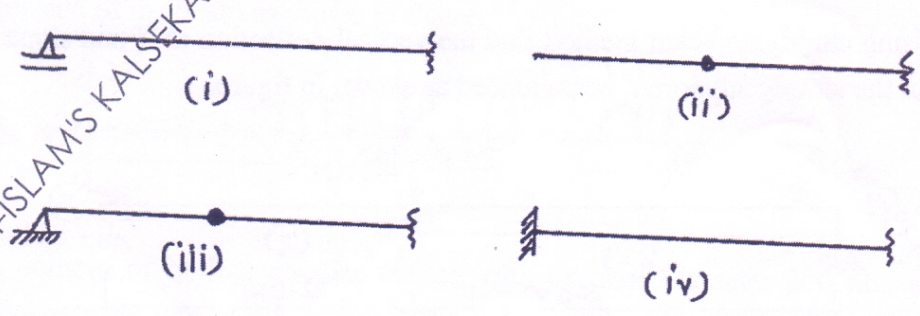
- (2) Attempt any three questions out of remaining five questions.
- (3) Assume suitable data wherever required and state it clearly.
- (4) Illustrate your answers with neat component sketches wherever required.

1. Attempt any four of the following

- (a) Differentiate the behavior of beam and an Arch. Find the reaction components for three hinged parabolic arch loaded as shown in figure 05



- (b) List out the various energy theorems and principles related to the elastic structures. Explain any one of them. 05
- (c) Explain the terms: (i) Product of inertia (ii) Unsymmetrical bending (iii) Shear center 05
- (d) Explain the function of each component of a suspension bridge consisting of suspension cable and three hinged stiffening girder. A symmetrical cable of span 40m with central dip 5m is loaded with udl of 25 kN/m. Find the maximum and minimum tension in the cable. 05
- (e) Define a conjugate beam. State Mohr's theorem I and II to determine displacement in a structure related to conjugate beam. Convert the following real beams in to the conjugate beams; 05

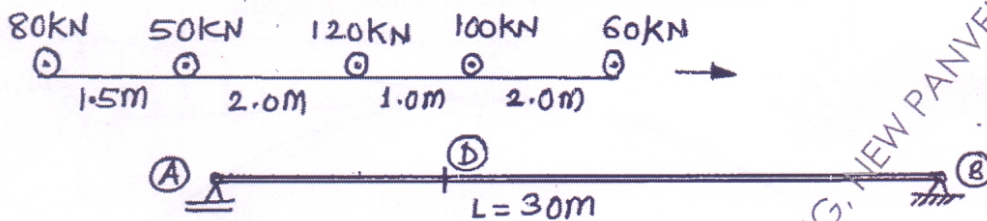


- (f) Explain ILD and state its importance in structural analysis. Draw ILD for reactions, S.F and B.M for S.S beam. 05

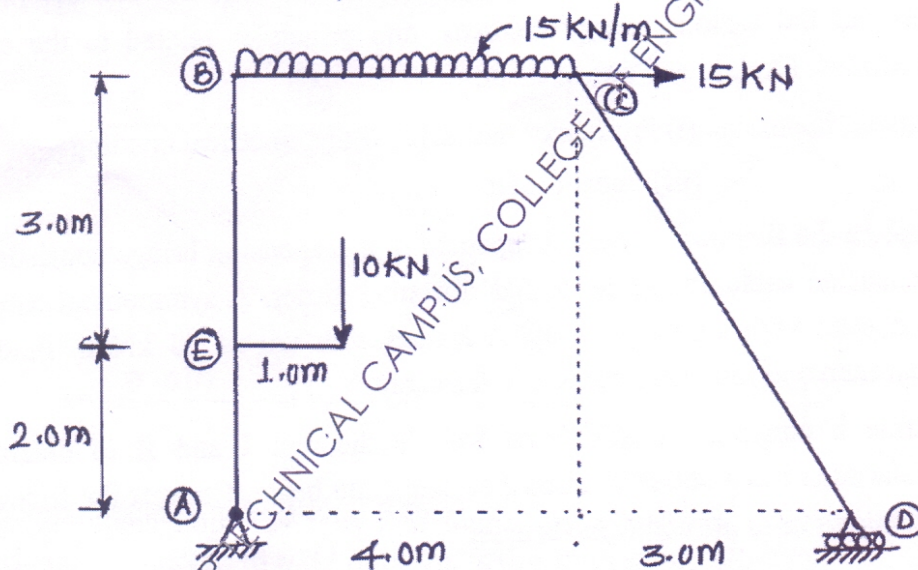
[TURN OVER

MUPD16025 ANJUMAN-ISLAM'S KALSEKAR TECHNICAL COLLEGE OF ENGINEERING, NEW PAVANEL 25-05-2016 13:33:07

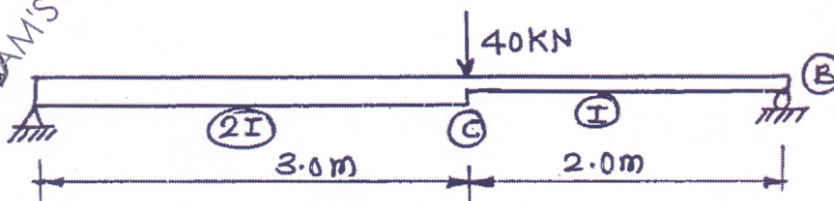
2. (a) A three hinged circular arch of span 30 m with central rise of 10 m carries a concentrated point load of 10 kN at 10 m from left hinge. Calculate; Support reactions, Maximum positive and negative Bending moment (Draw neat sketch). Also find Normal thrust and radial SF at left quarter point.
- (b) A simply supported girder AB of span 30 m is traversed by a system of wheel load as shown in figure. Calculate;
- (i) Maximum BM at section 'D' 10 m away from the left support.
- (ii) Location and magnitude of absolute maximum BM.



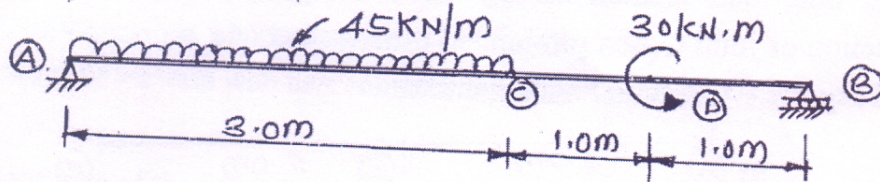
3. (a) For the plane frame as shown in figure. Draw free body diagram of each member and construct AFD, SFD and BMD.



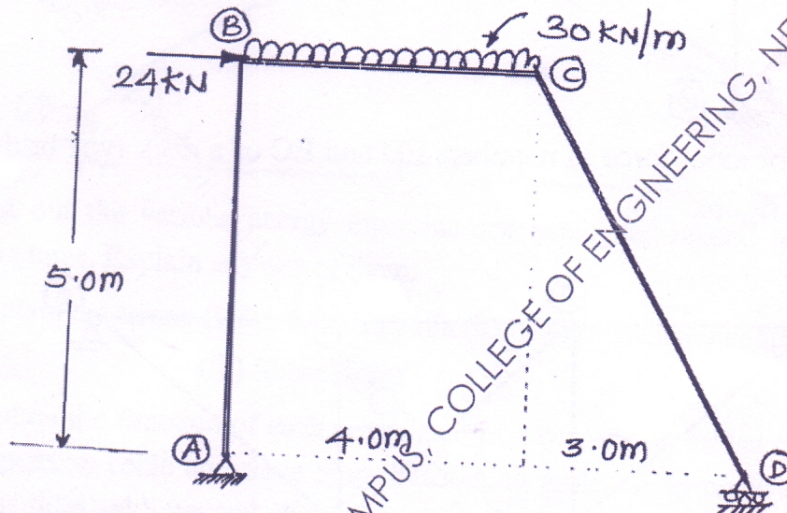
- (b) Using conjugate beam method find the vertical deflection at C and slope at B for the simply supported beam loaded as shown in figure.



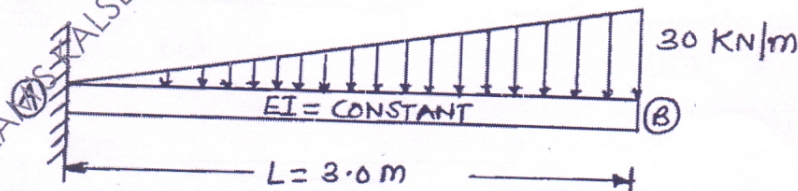
4. (a) Using Macaulay's method, determine maximum deflection and slope at the supports. Take $EI = \text{Constant}$. 06



- (b) Define strain energy. Write the expression for strain energy stored due to shear force, bending moment and twisting moment. 04
- (c) Using unit load method or Castigliano's second theorem, for the rigid jointed frame shown in fig. Calculate a horizontal displacement of roller support at D. Take $E = 200 \text{ Gpa}$. $I = 4 \times 10^8 \text{ mm}^4$. 10

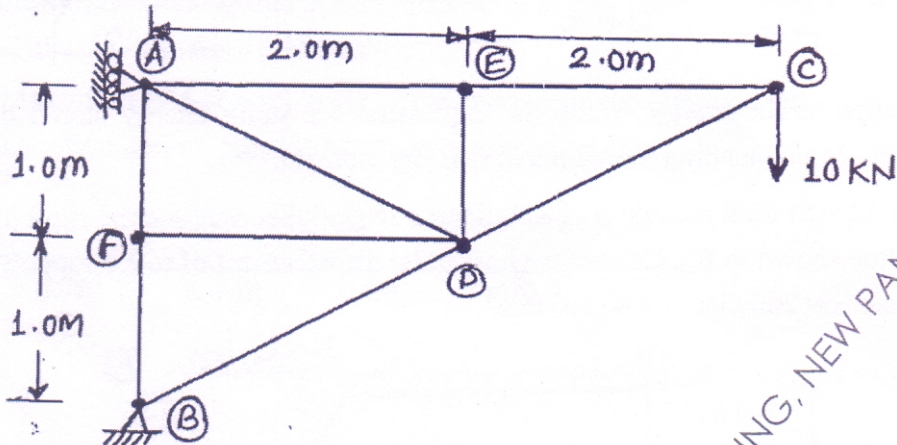


5. (a) A beam of rectangular cross section $80 \times 120 \text{ mm}$ is subjected to a uniformly distributed load of 10 kN/m . The plane of loading makes an angle of 30° with respect to y-y axis. If the span of beam is 6 m , locate the neutral axis and hence find the stresses at each corners of the beam. 07
- (b) Using moment area method, determine the vertical deflection and slope at free end of the beam as shown in figure. 07

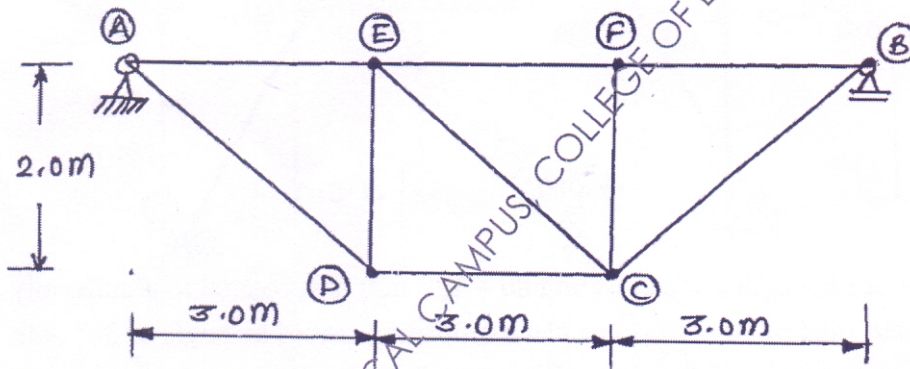


- (c) A column of hollow circular section with external diameter 300 mm and thickness 50 mm is 4.5 m long. It is pinned at both the ends. The column carries a load of 180 kN at an eccentricity of 40 mm . Find out the stresses produced at extreme fibre of the column section. Take $E = 200 \text{ kN/mm}^2$. 06

6. (a) Using unit load method or any other energy method, find the vertical deflection of joint C of a pin jointed truss loaded and supported as shown in fig. Take $AE = \text{Constant}$ for all members.



- (b) Draw ILD for axial force in members ED and EC of a deck type bridge truss as shown in figure.



- (c) Prove that shear force (radial shear) at any section of symmetrical three hinged arch subjected to u.d.l over the entire span is zero.

MUPD16025 ANJUMAN-ISLAM'S KALSEKATECHNICAL CAMPUS, COLLEGE OF ENGINEERING, NEW PANVEL 25-05-2016 13:34:15