**Code: 13A01301** **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations November/December 2016

**STRENGTH OF MATERIALS – I**

(Civil Engineering)

Time: 3 hours Max. Marks: 70

**PART – A**

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define factor of safety and Poison's ratio.
(b) Define strain energy and resilience.
(c) Draw the types of beams with neat sketches.
(d) Define shear force and bending moment.
(e) Determine the section modulus of rectangular cross section b x d.
(f) Draw the shear stress distribution for ' T' and 'I' sections.
(g) State Mohr's first and second theorems with reference to deflections of beams.
(h) Write the relationship between curvature, slope and deflection.
(i) Define conjugate beam.
(j) Draw the core sections for rectangular and circular sections.

**PART – B**

(Answer all five units, 5 X 10 = 50 Marks)

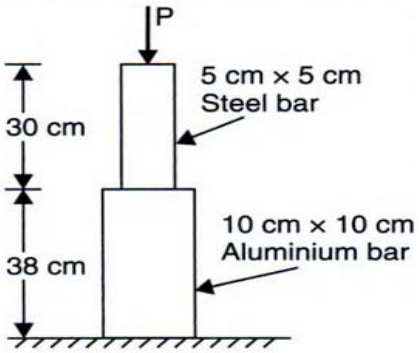
**UNIT – I**

2 (a) A 30 mm Aluminium rod 3 m long is subjected to an axial pull of 100 kN. Taking E = 70 GPa and poison's ratio 0.3, determine the elongation, change in diameter and volume of the rod. Estimate the bulk modulus.

(b) A steel rail is 30 m long and is at a temperature of $24^0$C. Calculate the thermal stresses developed in the rail when the temperature rises to $44^0$C if: (a) No expansion joint is provided. (b) A 6 mm gap is provided for expansion. Take E = 200 GPa, $\alpha_{ST} = 11 \times 10^{-6/0}$C.

**OR**

3 (a) A member formed by connecting a steel bar and Aluminium bar is loaded as shown in figure below. Calculate the magnitude of load P that will cause the total length of the member to decrease 0.25 mm. Take E value for steel and Aluminium is 210 GPa and 70 GPa respectively.




(b) A 15 mm thick rod 2 m long hangs vertically with a collar securely fixed at its end. A sliding weight of 200 N is dropped from a height of 60 mm on the collar. Determine the elongation and the stress developed in the rod due to impact. Take E = 200 kN/mm$^2$.

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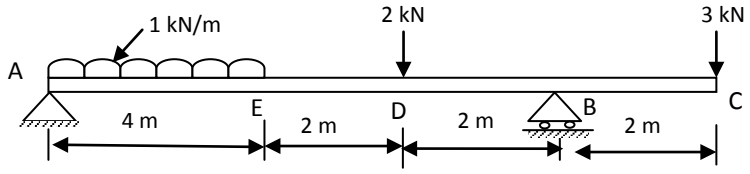
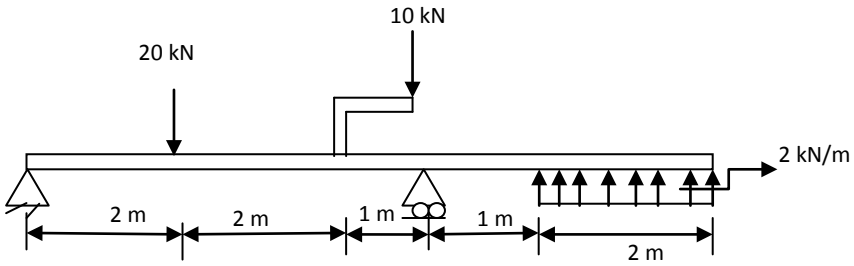
**UNIT – II**

4 A simply supported beam with overhang on the right is loaded as shown in figure below. Draw the shear force and bending moment diagrams. Locate the point of contra flexure.




**OR**

5 A simply supported beam with overhang on the right is loaded as shown in figure below. Draw the shear force and bending moment diagram.




**UNIT – III**

6 Derive the bending equation of simple beams: $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$.

**OR**

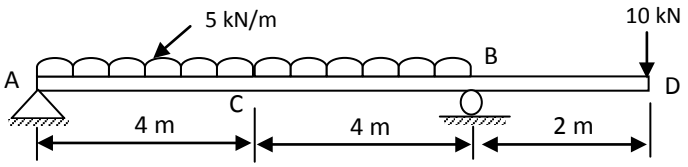
7 A T- joist of 8 x 150 x 10 mm, with 80 mm side horizontal is simply supported over a length of 2 m and carries a uniformly distributed load of 4 kN/m. Sketch the distribution of maximum shear stress intensities.

**UNIT – IV**

8 A beam of uniform cross section and of length 'L 'carries a uniformly distributed load 'w' per unit length. It is simply supported at the left hand end and at a point 'L/3' inside the right hand end. Show that the deflection of overhang end is $\frac{WL^4}{648\,EI}$.

**OR**

9 Find the deflections at points C and D of the beam loaded as shown in figure below, by Moment area method. Given E = 200 GPa, Moment of inertia of the beam = 66.67 x $10^6$ $mm^4$.




**UNIT – V**

10 A beam AB of constant cross section 4 m long is simply supported at its ends. It is loaded at points 1 m from each end with a load of 2000 N. Find the ratio of the deflections in the centre of the beam to the deflection at the point under one of the loads. Use Canjugate beam method.

**OR**

11 A reservoir 4 m high is 1 m wide at the top and 3 m wide at base, has vertical water face. Calculate the maximum and minimum stresses at the base for tank full and tank empty conditions. Density of masonry is 20 $kN/m^3$.

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