**END TERM- 2021**

MEC301-IB

Full marks- 30; Answer time- 60 min (+15 min for submission).

Answer any three questions.

1. (a) Define 'shear centre' and 'point of contraflexure'.

   (b) A rectangular cross section beam of 60mmX40mm size is subjected to a vertical shear force 80kN with 60mm vertical position. Show the distribution of shear stress along the depth and find the maximum and average shear stress developed in that section.   (3+7)

2. Draw the bending moment and shear force diagram for the beam as shown in the figure. Find the magnitude of bending moment and shear force at the mid span of the beam.   (10)
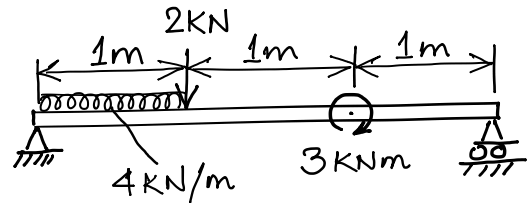
3. A 40mm diameter solid cylindrical shaft supported by bearings at B and D, is transmitting 50kW at 1000RPM from section A to section B, as shown in the figure. The resultant forces at A and C are 1.2kN and 4.0kN respectively, both vertically downward. Find the maximum shear stress developed in the shaft.   (10)
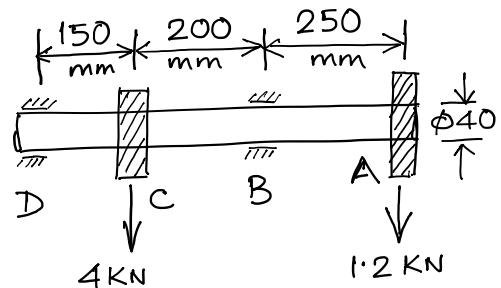
4. (a) Define the 'Maximum normal stress theory' and 'Maximum shear stress theory' of failure. Draw the safe zone of stress on a biaxial principal stress plane by those theory.

   (b) Find the maximum permissible pressure in a 1200mm long thin walled pressure vessel with shell thickness of 2.5mm and internal diameter of 500mm, if the limit yield stress is 110MPa. What is the maximum shear stress induced on the material in this state.   (5+5)