Printed Pages : 2   **Roll No.** ☐☐☐☐☐☐☐☐☐☐☐   **RME201**

B. TECH.
## THEORY EXAMINATION (SEM–II) 2016-17
ELEMENTS OF MECHANICAL ENGINEERING

Time : 3 Hours   *Max. Marks : 70*

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

SECTION – A

**1.** **Attempt all of the following questions:**   **7 x 2 = 14**

  (a) Explain Condition of equilibrium of coplanar-non concurrent forces.
  (b) Define the principle of transmissibility.
  (c) Explain free body diagram with example.
  (d) State and explain perpendicular axis theorem.
  (e) Differentiate between Microscopic and Macroscopic approaches.
  (f) Define modulus of Elasticity and modulus of rigidity.
  (g) Define parallelogram law of forces.

SECTION – B

**2.** **Attempt any five of the following questions:**   **5 x 7 = 35**

  (a) Two forces P and Q are inclined at an angle of 75°, magnitude of their resultant is 100N. The angle between the resultant and the force P is 45°. Determine the magnitude of P and Q.

  (b) Two smooth spheres each of radius 100 mm and weight 100 N, rest in a horizontal channel having vertical walls, the distance between which is 360 mm. Find the reactions at the points of contacts A, B, C and D shown in Fig. below
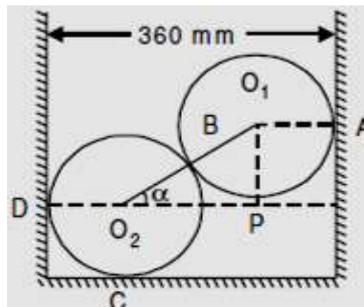
  (c) Determine the reactions at B and E of the beam, loaded as shown in fig. below
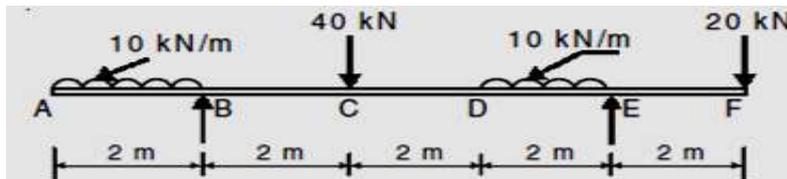
  (d) A wooden beam of rectangular cross section is subjected to a bending moment of 5 KNm . If the depth of the section is to be twice the breadth and stress in wood is 60 N/cm². Find the dimensions of the cross section of the beam.

  (e) A brass bar having cross-sectional area of 1000 mm^2 is subjected to axial forces shown in Fig. 3. Find the total elongation of the bar. Modulus of elasticity of brass= 100 GN/m^2
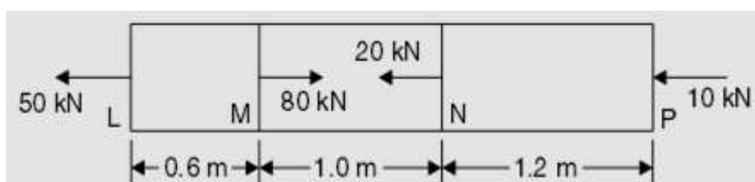
(f) State the Kelvin Planck and Clausius statements being used for second law of thermodynamics. Further, define; COP of a refrigerator and COP of a heat pump, and show that: $(COP)_{Heat\ pump}=1+(COP)_{Refrigerator}$.

(g) Explain the working of a 2 stroke S.I Engine with the help of neat sketch, P-v and T-s diagram.

(h) The internal energy of a certain substance is expressed by the equation u=3.62pv+86 where u is given in kJ/kg, p is in kPa and v is in m^3/kg. A system composed of 5kg of this substance expands from an initial pressure 550 kPa and a volume of 0.25 m3/kg to a final pressure of 125 kPa , in a process in which pressure and volume are related by $pv^{1.2}$=constant. If the expansion process is quasistatic, determine Q, Change in internal energy and Work for this process.
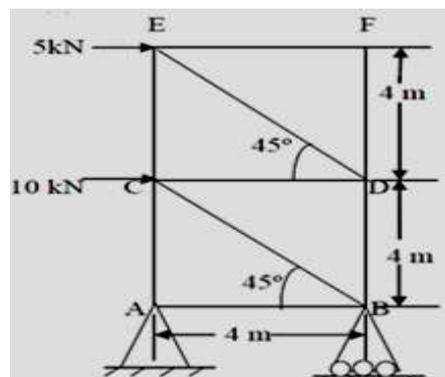
SECTION – C

Attempt any two of the following questions: **2 x 10.5 = 21**

3. **(a)** Derive the relationship between load, shear force and bending moment.

   (b) Draw the SFD and BMD of the a beam loaded beam as shown in fig. below
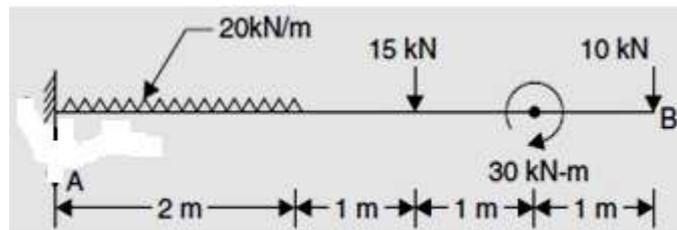
4. **(a)** Differentiate between perfect, imperfect and redundent truss.

   (b) Determine the forces in all the members of the truss shown in fig. below

5. Determine the MOI about centroidal X and Y axis of the I-section as shown in fig. below. All dimension in mm.

All dimensions in mm