**BOARD DIPLOMA EXAMINATION, (C-09)**

**MODEL PAPER**

**DAA – THIRD SEMESTER EXAMINATION**

**ENGINEERING MECHANICS**

**Time : 3 hours ] [ Total Marks : 80**

**PART – A 3 x 10 = 30 Marks**

***Instructions:*** (1) Answer **all** questions.

 (2) Each question carries **three** marks.

 (3) Write the units and draw neat sketches wherever necessary.

1. State the SI Units of a) length b) mass c) time d) plane
2. Define the following a) Force b) Resultant Force.
3. Calculate the forces in the members AB and Ac of the frame Shown in figure using Lami’s theorem:

600

450

750

1500

1350

1. Sketch the coplanar and non coplanar forces.
2. Define the following a) Centroid b) Axis of symmetry.
3. Find the position of centroid of one side vertical trapezoidal section of top width 2m, base width 8m and height 9m from vertical face.
4. Find the moment of inertia of a rectangle 60mm wide and 120mm deep about centroidal. Find also radius of gyration.
5. Define Modulus of Elasticity and Poisson’s ratio.
6. State parallel axis theorem.
7. State Hooke’s law.

**PART – B 10 x 5 = 50 Marks**

***Instructions:*** (1) Answer **any five** questions.

 (2) Each question carries **ten** marks.

 (3) Write the units and draw neat sketches wherever necessary.

1. Two forces of magnitude 200N and 300N acting at a point make an angle of 1500 between them. Determine the magnitude and direction of their resultant using law of parallelogram of forces.

1. Determine the magnitude and direction of resultant of the system of coplanar concurrent forces as given in figure.

30kN

20kN

600

450

750

40kN

750

60kN

1. Determine the centroid of the section Shown in figure (all dimensions are in mm)

100

20

200

20

100

1. Determine the moment of inertia about its horizontal and vertical centroidal axis of an L – section with dimension 100mm x 60mm x 20mm.
2. Determine moment of inertia and least radius of gyration of I – section given below.

500

25

25

400

25

400

1. A circular bar of 25mm diameter is subjected to an axial pull of 300kN. The elongation of the bar is 0.2mm on a gauge length of 200mm. The reduced diameter is found to be 0.04mm. Calculate a) Young’s modulus b) Poisson’s Ratio c) change in its volume.
2. A copper bar of 40mm diameter is rigidly attached at both ends to the inside of steel tube of 50mm external diameter and 5mm thick. Find stress in each metal of composite section of length 1000mm, when it is subjected to an axial load of 200kN. Take Es = 200 GPa and Ec = 100GPa
3. A solid bar 500mm long and 250mm diameter is placed in a copper tube of the same length. The tube has 300mm external diameter and 250mm internal diameter. The tube and the bar are connected at theirs ends rigidly and support an axial compressive force of 500kN together. Calculate the stress in each material and the load carried by steel bar as well as copper tube. Assume Young’s modulus of copper is to be half of the steel.