Dr K Nallasamy 27/2/2023

NATIONAL INSTITUTE OF TECHNOLOGY, HAMIRPUR (H.P)
End Semester Examination for I[st] Year (Section: A, B, C, D&E), I[st]-Semester: 2022 – 2023
CE-101 Applied Mechanics

Branch/Section: A, B, C, D&E
Course Name: Applied Mechanics
Duration: 3 hours, (2.30 P.M -5.30 P.M)
Date: 27.02.2023(Monday)
Hall No:
Instructions:

Semester: I
Course Code: CE 101
Mark.max: 50

a) Answer **any Five Questions Only**
b) All dimensions (Distance & Force Units) are in " m &kN " except when specified otherwise (S.I Units)
c) Assume necessary data wherever required.

(Q.1) Determine the **minimum mass *M*** necessary to prevent slipping **(Fig.1).** **(10 marks)**

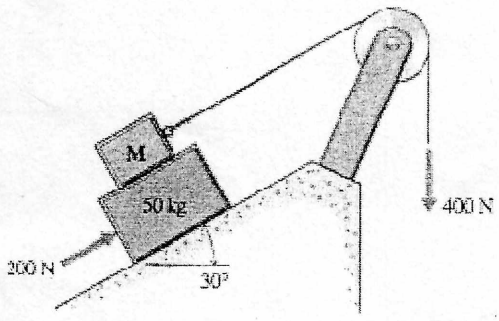

Fig.1

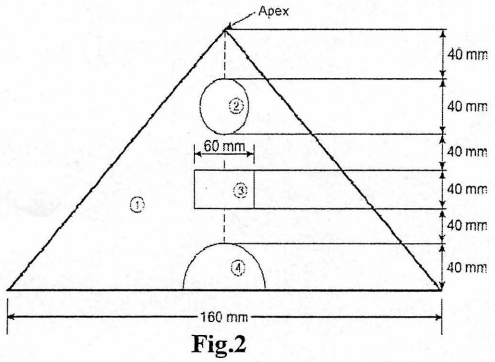

Fig.2

(Q.2) Locate the **Center of Gravity and Compute the Moment of Inertia about *xx* and *yy* axis (Central axis) and Polar Moment of Inertia about zz axis** for the following **Composite shape cross section of structures** as shown in Fig.2. **(10 marks)**

(Q.3)Determine the angle (θ) where the 50 *kg* bar is in equilibrium. The spring is un-stretched at $\theta = 60^0$ (Fig.3). **(10 marks)**

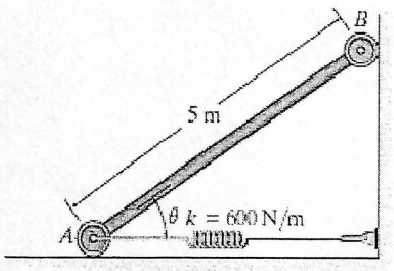

Fig.3

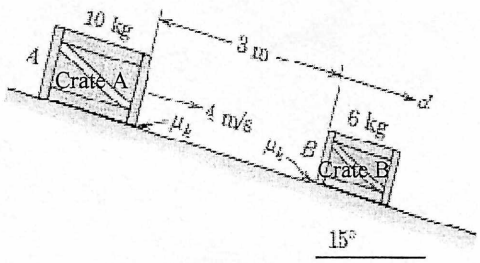

Fig.4

(Q.4). Crate A is traveling down the incline with a speed of 4 *m/s* when in the position shown (Fig.4). It later strikes and becomes attached to crate *B*. Determine the **distance *d* moved** by the pair after the collision. The co-efficient of kinetic friction is μ_k=0.60 for both crates. Solve this **Kinetic motion** problem by **principle of Impulse-Momentum Method.** **(10 marks)**

(Q.5)A truss that is loaded as shown in Fig.5. (a) Compute the **internal forces of all component membersof truss** Using **Method of Joints.**(b) Compute the **internal forces of *BE, BC* and *CE*** component members of trussusing**Method of Section.** **(10 marks)**

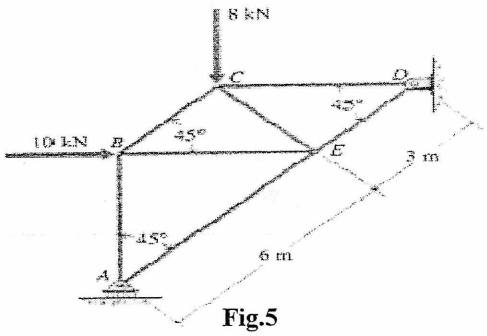

Fig.5

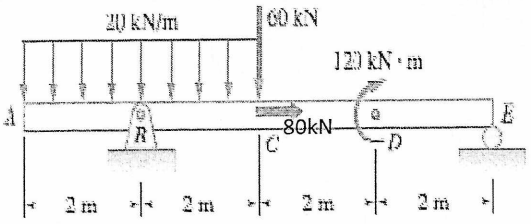

Fig.6

(Q.6) Construct the **Shear force, Axial force (Horizontal Thrust) and Bending moment diagrams** for the following loaded **one side overhang beam structure** as shown in Fig.6. **(10 marks)**

(Q.7) Construct the **Shear force, Axial force and Bending moment diagrams** for the **frame** as shown in Fig.7. **(10 marks)**

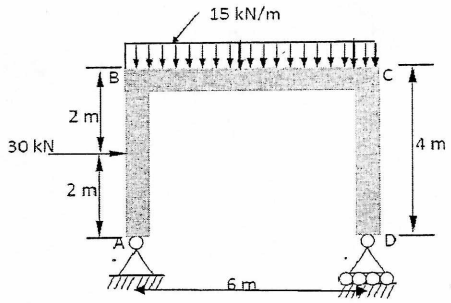

Fig.7

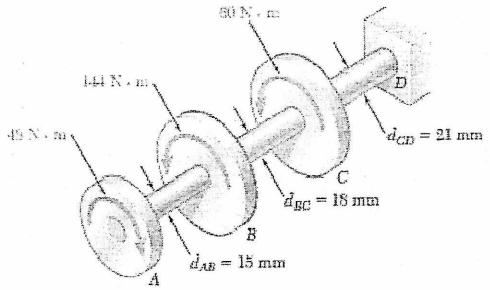

Fig.8

(Q.8) Knowing that an 8mm diameter hole has been drilled through each of the shafts *AB*, *BC*, and *CD* as shown in Fig.8.**Determine (*a*) the shaft in which the maximum shearing stress occurs, (*b*) the magnitude of that stress.** **(10 marks)**

(Q.9)A solid rod is subjected to axial load as shown in Fig.9.Determine the **Axial Displacement of points B, C& D.** Take $E = 200\ GPa$. **(10 marks)**

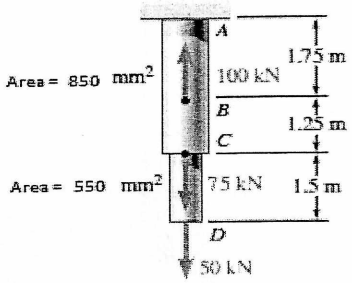

Fig.9

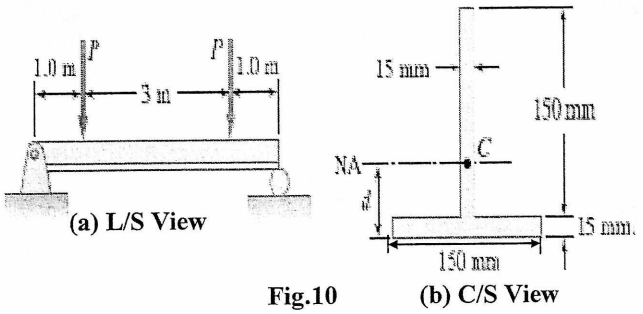

Fig.10

(Q.10)A beam L/S view and C/S view are shown in Fig. 10(a) & (b).(a) **Compute the largest value of *P*** if the bending stress is not to exceed 48 *MPa* in Tension and 140 *MPa* in compression (b) **Compute the largest value of *P*** if the shear stress is not to exceed 30 *MPa*. **(10 mark)**