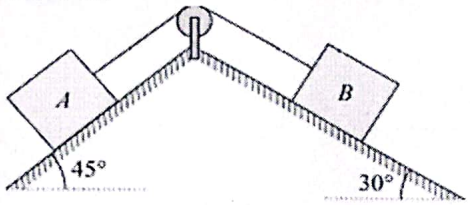
Kathmandu University
Department of Mechanical Engineering

ENGG 111 | **First Internal** | **FM: 30**
Date: 5/6/2024 | **CE** | **Time: 1hr 30min**

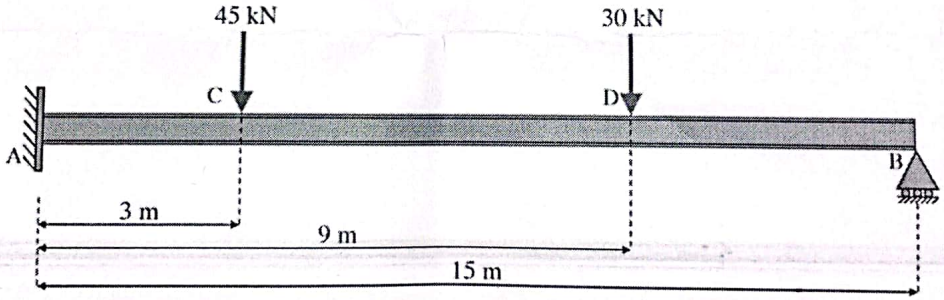
SET-C

Read the questions carefully. Assume data, if missing. Each question carries 5 marks

1. A horizontal water pipe of diameter 15 cm converges to diameter 7.5 cm. If the pressures at two sections are 400 kPa and 150 kPa respectively, calculate the flow rate of water. Which flowline would give us the magnitude and direction of the flow velocity? Define that flowline with a figure relevant to the numerical.
2. In the system of blocks shown in Figure, if the weight of block B is 150 N and weight of block A is 48.12 N, determine the coefficient of friction for all the contact surfaces for which motion is impending. Assume that the coefficient of friction is the same for contacts between block A and the ground and for contact between block B and ground. Assume the pulley at the top to be frictionless. What would be the coefficient of friction if the weight of A is 202.67 N?



3. For the beam structure shown, find the reactions at supports:



4. For a site with requirement for continuous flow, which pump among reciprocating or centrifugal will you recommend. List its parts, their functions, and the working of the pump. Differentiate between the two types of pumps.
5. Explain Kelvin Plank Statement of Second Law of Thermodynamics. During the compression stroke an IC engine rejects 25 kJ/kg of heat to the cooling water. The work input to the stroke is 75 kJ /kg. Calculate the change in the internal energy of working fluid.
6. Explain Brayton Cycle with process diagram. Both a gage and a manometer are attached to a gas tank to measure its pressure. If the pressure gage reads 80 kPa, determine the distance between the two fluid levels of the manometer if the fluid is mercury whose density is 13600 kg/m^3.