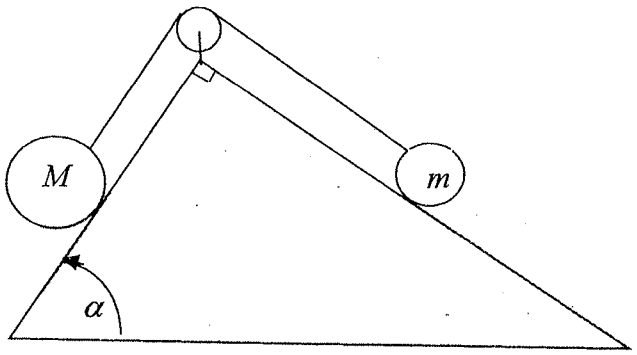
The Open University of Sri Lanka
B.Sc./B.Ed. Degree Programme – Level 05
Open Book Test (OBT) – 2023/2024
Applied Mathematics
ADU5303- Newtonian Mechanics II
Duration :- One Hour

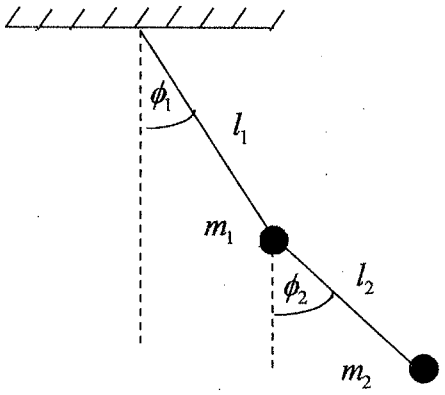
Date :- 29-12-2023 **Time :- 4.00 p.m. – 5.00 p.m.**

Answer All Questions.

1 Two particles of mass M and m are connected by an inelastic string and placed on two fixed inclined planes as shown in the diagram. The coefficient of friction between the particles and the planes is μ. Using D'Alembert's principle, determine the acceleration of the particles and tension in the string.



2. The double pendulum swinging in a vertical plane consists of two bobs of masses m_1 and m_2 at ends of two weightless rods of lengths l_1 and l_2 and one of them is fixed to a rigid support as shown in figure.



(a) Show that the Lagrangian of the system is given by

$$L=\frac{1}{2}(m_1+m_2)l_1^2\dot{\phi}_1^2+\frac{1}{2}m_2l_2^2\dot{\phi}_2^2+m_2l_1l_2\dot{\phi}_1\dot{\phi}_2\cos(\phi_1-\phi_2)+(m_1+m_2)gl_1\cos\phi_1+m_2gl_2\cos\phi_2$$

(b) Hence, obtain the Lagrange's equations of motion.