MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2024/2025 ACADEMIC YEAR

THIRD YEAR **FIRST** SEMESTER EXAMINATION FOR BACHELOR

OF TECHNOLOGY (MECHANICAL ENGINEERING)

EMT – ENGINEERING DESIGN I

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer question ONE and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A – ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a) Explain the **THREE** types of Kinetic friction.   (3 marks)

b) Explain the following terms

     i.   Non-viscous friction   (2 marks)
     ii.   Viscous friction   (2 marks)

c) With the help of sketches, explain the following types of belts;
     i.   Flat belt   (2 marks)
     ii.   V-belt   (2 marks)
     iii.   Circular belt   (2 marks)

d) Explain the concept of 'slp' in belts.   (2 marks)

e) Define the following terms with regards to screws:
     i.   Helix   (1 mark)
     ii.   Ditch   (1 mark)
     iii.   Lead   (1 mark)

f) State the circumstance in which a multiple disco clutch may be used.   (2 marks)

g) Explain the following terms as used in radial cams:
     i.   Base circle   (1 mark)
     ii.   Trace Point   (1 mark)
     iii.   Pressure angle   (1 mark)

h) Show that the efficiency of a body up an indine plane when the effort is applied horizontally is given.

(i) A body resting on a rough horizontal plane required a pull of 180 N inclined at 30^0 to the horizontal to just move the body. Determine the weight of the body and the co-efficient of friction.   (3 marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

An electric motor driven power screw moves a nut in a horizontal plane against a force of 75KN at a speed of 300mm/min. The screw has a single square thread of 6mm pitch on a major diameter of 40 mm. The co-efficient of friction at the screw threads is 0.1. Estimate the power of the motor.

QUESTION THREE (20 MARKS)

An engine, running at 150ram, drives a tire shaft by means of a belt. The engine pulley is 750mm diameter and the pulley on the line shaft being 45 mm. A 900mm diameter pulley on the line shaft drives a 150 mm diameter pulley keyed to a dynamo shaft. Find the speed of the dynamo shaft when;

    a) There is no slip   (10 marks)

    b) There is slip of 2% at each drive   (10 marks)

QUESTION FOUR (20 MARKS)

a) A bicycle and rider of mass 100 kg are travelling at the rate of 16 Km/hr on a level road. A brake is applied to the rear wheel which is 0.9m in a diameter and this is the only resistance acting. How far will the bicycle travel and how many turns will it make before it comes to rest? The pressure applied on the brake is 100N and $\mu = 0.05$.   (10 marks)

b) A single plate clutch, effective on both sides, is required to transmit 25KW at 3000rpm. Determine the outer and inner radii of frictional surface if the co-efficient of friction is 0.255. The ratio of radii is 1.25 and the maximum pressure is not to exceed $0.1N/mm^2$. Assume the theory of uniform wear.   (10 marks)