(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

EXAMINATIONS FOR THE DIPLOMA

IN

MECHANICAL AND INDUSTRIAL ENGINEERING

COURSE CODE: DME 067

COURSE TITLE: MECHANICS OF MACHINES I

DATE: 25/04/2022   **TIME: 12:00-2:00 PM**

INSTRUCTIONS TO CANDIDATES

Answer Question **ONE** and any other **TWO** questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

1

QUESTION ONE   30MARKS

a) Define the following terms.   (3mks)

    i.   Radius of gyration

    ii.   Impulsive force

    iii. dynamics

b) From the first principle show that the periodic time for a compound pendulum is given by $T_p = 2\pi \sqrt{\dfrac{k^2 + h^2}{gh}}$ (6mks)

c) With the aid of sketches differentiate between single block brake and double block brake   (4mks)

d) Give three types of friction clutches   (3mks)

e) A winding drum raises a load of mass 600kg through a height of 120m. The drum has a mass of 300kg and an effective radius of 0.6m and a radius of gyration of 0.4m. the mass of the rope is 2kg/m. The cage has at first an acceleration of 1.5 m/s² until a velocity of 9m/s is reached after which the velocity is constant until the cage nears the top when the final retardation is 6m/s². Find

    i.   The time taken for the cage to reach the top.   (4mks)

    ii.   The distance travelled during constant velocity.   (2mks)

    iii. The torque applied to the drum at the starting torque.   (2mks)

    iv. The power at the end of acceleration.   (2mks)

f) State **FOUR** properties of brake lining material   (4mks)

QUESTION TWO   (20 MARKS)

a) A car moving with a velocity of 10 m/s accelerates uniformly at the rate of 2m/s² to reach a velocity of 15 m/s. Find

    i.   The time taken.   (2mks)

    ii.   The distance travelled in this time.   (2mks)

b) Two pulleys one 450mm diameter and the other 200mm diameter are on parallel shafts 1.95m apart and are connected by a cross belt. Find the length of the belt required and the angle of contact between the belt and each pulley.

What power can be transmitted by the belt when the larger pulley rotates at 200 rev/min, if the maximum permissible tension in the belt is 1KN and the coefficient of friction between the belt and the pulley is 0.25.   (16mks)

QUESTION THREE   (20 MARKS)

a) Give **THREE** differences between a flywheel and a governor.   (6mks)

b) An electric motor drives a punching press which is capable of punching 40 holes in 3 minutes. The radius of gyration of the flywheel attached to the press is 500mm. The flywheel is running at 250 rpm. Each punching operation requires 12000 Nm of work and takes 1.5s. Determine   (14mks)

    i.   The rating of the motor in Kw.

    ii.   The mass of the flywheel if the speed of the flywheel does not drop below 230 rpm.

QUESTION FOUR   (20 MARKS)

Each arm of porter governor is 180 mm long and pivoted on axis of rotation. Mass of each ball is 4kg and that of sleeve is 18kg. The radius of gyration of the ball is 100mm when the sleeve begins to rise and 140 mm when at the top. Determine the range of speed. Find the coefficient of insensitivity if the friction at the sleeve is 15N.   (20mks)

3