



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING DIPLOMA IN ELECTRICAL & ELECTRONIC ENGINEERING

EME 2130 MECHANICAL TECHNOLOGY

END OF SEMESTER EXAMINATIONS

YEAR 2 SEMESTER I

SERIES: DECEMBER, 2013

TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. You should have the following for this examination:
 - Answer Booklet
 - Non-programmable Scientific Calculator
2. This paper consists of **FIVE** Questions.
3. Answer **ANY THREE** Questions.
4. All Questions carry equal marks.
5. **This paper consists of THREE printed pages.**

Question ONE

- (a) State the **FOUR** factors that the amount of power transmitted by a belt depends upon. **(4 marks)**
- (b) A belt drive transmits power from an electric motor to a machine. The diameter of the pulley on the motor shaft is 150mm, that on the machine is 200mm and the centre distance is 600mm. If the motor speed is 1440rev/min and the maximum permissible transmitted is 60kW. It is required to increase the power transmitted to 6.75kw using the same pulleys, centre distance and motor speed. The belt material is to be treated with a preparation which increases the coefficient of friction by 10% and in addition a jockey pulley is to be fitted. Determine:
- (i) Original coefficient of friction
 - (ii) The view angle of lap
- (16 marks)**

Question TWO

- (a) State **FIVE** advantages of welded joints over riveted joints. **(2½ marks)**
- (b) A double riveted lap joint is made between 15mm thick plates. The rivet diameter is 25mm. If the ultimate stress in shear is 320MPa, find the shear force that will rupture the joint. **(17½ marks)**

Question THREE

- (a) Explain the function of each of the following steam plant components and state the energy equation for each:
- (i) Boiler
 - (ii) condenser
 - (iii) Steam turbine
- (6 marks)**
- (b) Carnot cycle using steam operates between 30 and 0.04 bar. Calculate the heat, work transfer cycle efficiency and work ratio for the cycle. **(14 marks)**

Question FOUR

- (a) State the second law of thermodynamics. **(2 marks)**
- (b) Illustrate the steam plant circuit in a simple labeled block diagram. **(8 marks)**
- (c) A steam turbine plant operates on the Rankine cycle. Steam is delivered from the boiler to the turbine at a pressure of 30 bar and with a temperature of 350°C. Steam from the turbine

exhausts into a condenser at a pressure of 0.1 bar. Condensate from the condenser is returned to the boiler by means of a feed pump. Neglecting losses, determine:

- (i) The energy supplied at the boiler per kg of steam generated.
- (ii) The dryness fraction of the steam entering the condenser.

(10 marks)

Question FIVE

- (a) State **TWO** advantages and disadvantages of gear drives as compared to other drives. **(4 marks)**
- (b) In a neat sketch label the six main parts of a gear profile. **(5 marks)**
- (c) In Figure 1, a motor rotates wheel A, which is geared to wheel B and hence lifts the load by a rope wrapping around the drum has a diameter of 500mm. Wheel B has 100 of inertia of the motor, shaft and wheel is 0.8kgm^2 , and the moments of inertia of the rope drum and wheel is 10kgm^2 . Find the torque at the motor to lift the load at 1m/s^2 . **(11 marks)**

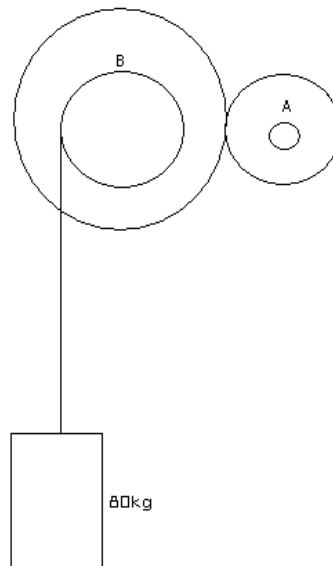


Fig. 1