THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING

DIPLOMA IN CHEMICAL ENGINEERING

ECH 2202 UNITS I

YEAR II SEMESTER I SUPPLEMENTARY EXAMS

SERIES OCTOBER 2011

TIME 2HRS

INSTRUCTION TO CANDIDATES

You should have the following for this examination

- Answer booklet
- Drawing instruments
- Drawing paper A2

This paper consists of **FIVE** questions.

Question **ONE** is Compulsory and other **TWO** questions.

Maximum marks for each part of a question are as shown.

Question ONE

(a) Establish a formula for the maximum torque transmitted by a single plate clutch of internal and external radii r_1 and r_2, if the limiting coefficient of friction is μ and the axial spring loading is w. Assent pressure intensity on the contact faces is uniform.

(10 Marks)

(b) Modify the expression for maximum torque derived above assuming that the wear is uniform over the contact area. **(4 Marks)**

(c) An axial thrust of 50kN is carried by a plain collar-type thrust bearing, having inner and outer diameter of 250mn and 400mn respectively. Assuming that μ between the thrust surfaces is 0.02 and that the local wear rate of these surfaces is proportional to the pressure and to the rubbing speed, determine the power observed in friction at a speed of 120rev/min. **(6 Marks)**

Question TWO

(a) Derive the expression for the power transmitted in a pulley drive when the belt is about to ship ignore the centrifugal tension. **(14 Marks)**

(b) A load is dragged by means of a pulley and robe. The pulley which has a diameter of 500mm, turns at 30rev/min. The robe makes 3 complete turns around the pulley, μ being 0.25, and at the free end of the rope a pull of 100N is applied.
Calculate:

(i) The pull on the load
(ii) The power required to drive the pulley.

(6 Marks)

Question THREE

(a) Define the following terms as applied in spur gearing:

(i) Diametral pitch
(ii) Module
(iii) Circular pitch
(iv) Addendum
(v) Addendum
(vi) Working depth

(6 Marks)

(b) A premier of 20 involutes teeth and 125mm p.c.d drives a rack. The addendum of both pinion and rack is 4mm:

(i) Inlet is the least pressure angle which can be used to avoid undercutting?
(ii) Find the length of the arc of contact and the minimum number of teeth in contact at a time.

(14 Marks)

Question FOUR

Determine the time required to accelerate a countershaft of rotating mass 500kg and radius of gyration 200mm to the full speed of 250rev/min from vest through a single-plate dutch of internal and external radii 125mm and 200mm respectively taking $\mu = 0.3$ and the spring lead as 600N. **(20 Marks)**

Question FIVE

A leather belt, 125mm wide and 6mm thick, transmits power from a pulley 750mm diameter which runs at 500 rev/min. The angle of lap is $150°$ and $\mu = 0.3$. If the mass of $1m^3$ of leather is 1Mg and the stress in the belt is not to exceed $2.75mw/m^2$, find the maximum power which can be transmitted). **(20 Marks)**