TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

BSC MECHANICAL ENGINEERING

EMG 2311 : DESIGN OF TRANSMISSION SYSTEMS

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: Pick Date Select Month Pick Year

Instructions to Candidates
You should have the following for this examination
   -*Answer Booklet, examination pass and student ID*
This paper consists of **FIVE** questions. Attempt any THREE questions.
Do not write on the question paper.

Question ONE

a) Identify any five types of screwed fasteners   (5 marks)

b) Briefly explain 3 ways of eliminating chance of failure of bolts due to negligence of the mechanic

(3 marks)

c) How that the final or total load on a bolt with gasket is given by

$F_b = F_i + KFa$

Where F_b- Final force/load on bolt

K= Stiffness coefficient in a case where a gasket is used

Fa= External or applied load

(7 marks)

d.) An eyebolt is not initially stressed, determine suitable diameter of threaded part for direct load of 3 tones. Yield stress of material is 270 MPa and factor of safety is 2.5. (3 marks)

e.) If thickness of gasket is 3 mm and total area of gasket is 15000 mm^2. Find the value of K if 15 bolts each having 160 mm^2 stress area are used. Values of Young's Modulus of elasticity are 210, 90 and 140 GPa for bolt, flange and gasket respectively. (7 marks)

Question TWO

a.) Briefly discuss materials and manufacture for bolts (6 marks)

b.) Explain the difference between rolled and machined bolts (2 marks)

c.) The effective diameter of an air compressor is 250 mm. The maximum pressure on the cylinder head is 10 bars. Cold rolled steel bolts with following properties are available for fastening the head δy=350, δu=450 and δeng.=225 MPa. Select suitable number of bolts and specify their diameter and initial tension. (17 marks)

Question THREE

a.) Use diagrams to describe the construction of ball bearings (7 marks)

b.) Explain the two classes of plain bearings (4 marks)

c.) Identify and explain various applications for oils and greases in lubrication (4 marks)

d.) A mild steel shaft has to transmit 150 hp at 300 rpm. The maximum torque to be transmitted is 30% greater than average torque. Due to operational requirements of the system, the angle of twist of the shaft must not exceed 1° in a length of 20 diameters. The shafts are in correct alignment and the coupling must allow easy dis assembly. Allowable stress is 40 N/mm^2. Design a suitable coupling

(10 marks)

Question FOUR

a.) Explain five ways of preventing interference in gears (5 marks)

b.) Explain the application of Dunkerley's semi empirical equation (3 marks)

c.) State factors that determine critical speed of a shaft (4 marks)

d.) A shaft is supported by two bearings 400 mm apart and carries a bevel gear of 200 mm pitch diameter at one end overhanging beyond the nearer bearing by 150 mm. The gear produces a radial load of 10.8 kN

and thrust load of 2.85 kN when speed is 700 rpm. Determine the shaft diameter if the shaft is made of steel for which the designs shear stress is 30N/mm².

(13 marks)

Question FIVE

a.) Explain 5 factors that determine the power transmitting capacity of a belt drive (5 marks)

b.) Explain the following with the aid of a diagram

i.)   Pressure angle
ii.)   Pitch circle
iii.)   Root circle
iv.)   Addendum
v.)   Dedendum
vi.)   Clearance

(6 marks)

c.) The maximum center distance between two parallel spur gears is to exceed 220 mm. The gear ratio is to be 4:3 with module of 12 mm and pressure angle of 20°. Do all calculations necessary for design of the gear pair.   (14 marks)