TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology
Department of Mechanical & Automotive Engineering
UNIVERSITY EXAMINATION FOR:
Diploma in Marine Engineering
EMR 2219 : Applied Mechanics II
END OF SEMESTER EXAMINATION
SERIES: AUGUST 2019
TIME: 2 HOURS
DATE: Pick Date **Aug 2019**

Instruction to Candidates:

You should have the following for this examination

- *Student I.D. Card & Examination Pass*
- *Answer booklet*
- *Non-Programmable scientific calculator*

This paper consists of **FIVE** questions. Attempt any **THREE** questions.
Maximum marks for each part of a question are as shown.
Do not write on the question paper.

Question ONE

A boiler shell 2 m mean diameter is constructed of steel plate having an ultimate tensile strength of 450 MN/m^2. If the thickness of the shell plate is 20 mm calculate the internal gauge pressure to which the boiler may be subjected assuming a factor of safety of 6 and a longitudinal joint efficiency of 80%. **(20 marks)**

Question TWO

a) Derive the torsion equation and state the assumptions made in the analysis. **(10 marks)**

b) A hollow steel shaft 400 mm external diameter transmits 9 MW at 120 rev/min. If the angle of twist measured over a length of 2 m is 0.45° and G is 80 GN/m^2, estimate the internal diameter of the shaft, the maximum shearing stress and the strain energy per metre length of the shaft. **(10 marks)**

Question THREE

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

Question FOUR

A multi-plate clutch is to transmit 12 kW of power at 1500 rev/min. The inner and outside radii for the plates are to be 50 mm and 100mm respectively. The maximum axial spring force is restricted to 1 kN. Calculate the necessary number of pairs of surfaces if $\mu = 0.35$ assuming constant wear. Determine also the necessary axial force.

(20 marks)

Question FIVE

a) Explain factors to consider in selecting suitable gear for a given application.
b) A gear wheel having 20 teeth of involute form of 6.5 modules and angle of obliquity 20^o drives another wheel of the same dimensions. Calculate the length of the arc of contact if the addendum is 6.5 mm.

(20 marks)