MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS
ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2023/2024 ACADEMIC YEAR

…….. YEAR **SECOND** SEMESTER EXAMINATION FOR, BACHELOR OF
SCIENCE IN ………………………..

EMT 308– ENGINEERING DESIGN 11

DURATION: 2 HOURS

Instructions to candidates:

1. Answer question One and Any Other Two questions.

2. Mobile phones are not allowed in the examination room.

3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

1. Use four advantages of rolling contact bearing   (4marks)
2. With a well labelled diagram explain any two types of studying lubrication (4marks)
3. List any three properties of bearing materials   (3marks)
4. What is the difference between a jig and fixture   (3marks)
5. For the double reduction gear train with an idler shown in figure 1, if the input speed is 1750 r.p.m in a clockwise direction, what is the output speed   (3marks)
6. State four design consideration for shaft   (4marks)
7. State and explain two general types of coufiling used to transmit flower from one shaft to another   (4marks)
8. State three types of friction clutches   (3marks)
9. Explain two functions of dynamic seals in rotating shafts   (2marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

1. Consider the sections of a semi-ecliptic leaf spring shown in Figure 2. (consider a casenof one leaf 1 strip). Define the expression for ;
a) Maximum stress   (4marks)
b) Deflection   (4marks)
2. Calculate the thickness and number of leaves of a semi-eclitic carriage spring which is required to support a central wad of 2kn on a span of 1m if the maximum stress is limited to 225mpa and the central deflection to 75mm. The breath of each leaf can be assumed to be 100mm. Take for spring material E = 210Gpa.   (6marks)
3. With an aid of a well labelled diagram explain two examples of journal bearing   (6marks)

QUESTION THREE (20 MARKS)

1. List and briefly describe any three principles of economic design   (6marks)
2. Explain the term fool proofing as commonly used in design of jigs and fixtures (3marks)
3. Explain any three material properties that concern the tool designer   (6marks)
4. Explain five general objectives of jig and fixture design for wielding operations (5marks)

QUESTION FOUR (20 MARKS)

1. Explain three principles that should be observed while designing shafts   (3marks)
2. With the aid of neat sketches explain three types of belts commonly used for power transmission   (6marks)
3. A fan is belt driven by an electric motor running at 1500 r.p.m. The fully diameters for the fan and motor are 500 and 355 mm, respectively. A flat belt has been selected with a width of 100mm, thickness of 3.5mm, coefficient of friction of 0.8, density of $1100kg/m^3$ and permissible stress of 11mpa. The Centre distance is 1500mm. Determine the flower capacity of the belt   (5marks)
4. A dry single plate clutch is to be designed for an automotive vehicle whose engine is rated to give 100kw at 2400 r.p.m and maximum torque 500Nm, the outer radius of friction plate is 25% more than the inner radius. The intensity of pressure between the plates is not to exceed $0.07N/mm^2$. The coefficient of friction may be assumed to be equal to 0.3. The helical springs requires by this clutch to provide axial force necessary to engage the clutch are eight. If each spring has stiffness equal to 40N/mm, determine the initial compression in the springs and dimensions of the friction plate   (6marks)