DAR ES SALAM INSITUTE OF TECHNOLOGY

MECHANICAL ENGINEERING DEPARTIMENT

ENGINEERING DRAWING MET (G)05101)

SEMESTER TWO (2) EXAMINATION

Class; GC17ME

Time: 2hours JULY /2018

INSTRUCTIONS:

1 Attempt all sub questions in section A and any three (3) questions in section B

2 Borrowing instruments in the examination room is strictly prohibited.

3 Cell phones are not allowed in the examination room.

This paper consists of 6 printed pages

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DAR ES SALAAM INSTITUTE OF TECHNOLOGY

MECHANICAL ENGINEERING DEPARTMENT

SEMESTER II CONTINUOUS ASSESSMENT 2017/2018

MET G5302 BASIC MACHINE ELEMENTS TEST 2

GC 17 ME NTA 7

TIME: 1 HOUR THUR. 14TH JUNE 2018

INSTRUCTIONS

- ANSWER **ALL THREE(3)** questions(Q.3 being compulsory).
- Marks are as given to each question and parts.

1. (a) What is the difference between a shaft and an axle? (2)
   (b) What is a spindle? (2)
   (c) List at least four properties of materials required for shafts. (4)
   (d) State the two most common types of failure for shafts and mention the causes in each. (4)

2. (a) Briefly explain why the following features appear in shafts?
   (i) Steps and collars. (2)
   (ii) Fillet radii. (2)
   (b) Fig. Q. 2.(b) is a Z section. Determine the area moment of inertia of the section about a horizontal c.g. axis parallel to the legs. Dimensions in cm. (6)

3. Calculate a suitable outer diameter of a hollow shaft at a section where a bending moment of 400 Nm and a twisting moment of 2 kNm act. The material of the shaft has S_{ut}=370 MPa and S_{yt}=240 MPa. The ratio of the inner to outer diameters is to be 1:2. (8)

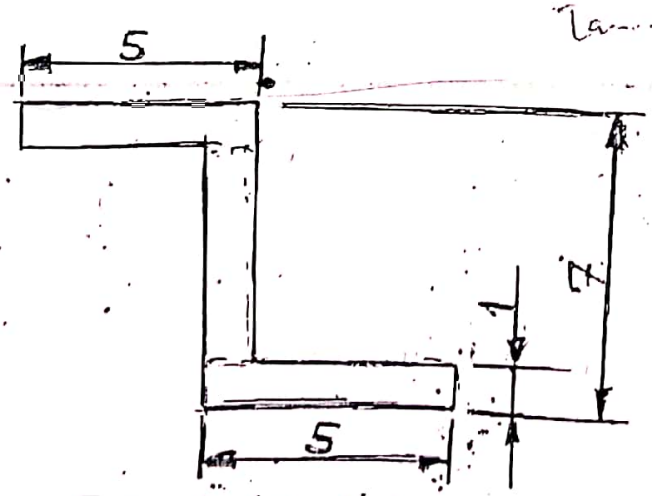

FIG. Q. 2.(b)

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DAR ES SALAAM INSTITUTE OF TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
SEMESTER II EXAMINATIONS 2016/2017
MET G5102 BASIC MACHINE ELEMENTS TEST 2
B. ENG. 16M (GC) NTA 6
TIME: 1 HOUR SUN. 18TH JUNE 2017

INSTRUCTIONS

- *Attempt **ALL THREE (3)** questions.*
- *Marks are as given to each question and parts.*

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1. (a) Differentiate between a shaft and an axle. **(2)**

   (b) What is a spindle? **(2)**

   (c) List at least four properties of materials required for shafts. **(4)**

   (d) There are two main types of failure for shafts. State them and mention the causes of failure to each. **(4)**

2. (a) Briefly explain why the following design features are found in shafts:-

   (i) Steps and collars **(2)**

   (ii) Fillet radii. **(2)**

   (b) Fig. Q. 2. (b) is an unequal angle section. Determine the area moment of inertia of the section about a horizontal axis through the c.g. parallel to the shorter leg. **(6)**

3. Determine the diameter of a solid circular shaft at a section where the bending moment is 400 Nm and a twisting moment is 2 kNm. **(8)**
   The material of the shaft has S_{ut}=370MPa.

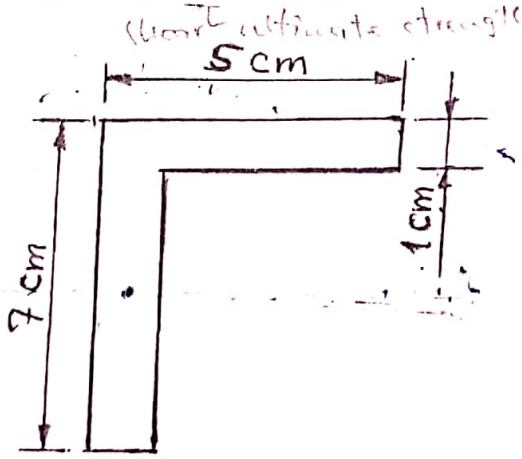

Fig. Q. 2. (b)

DAR ES SALAAM INSTITUTE OF TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
SEMESTER II CONTINUOUS ASSESSMENT 2018/2019
MET G5302 BASIC MACHINE ELEMENTS
GC 18ME NTA 6 TEST NO. 2

TIME: 1 HOUR FRI. 21ST JUNE 2019.

INSTRUCTIONS

- Answer **ALL THREE(3)** questions(Qns. 2 and 3 are compulsory).
- Marks are as given to each question and parts.

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1. (a) D ifferentiate between a spindle and an axle. **(2)**
   (b) List at least four properties of materials required for shafts. **(4)**
   (c) State the two main types of failure for shafts and mention the causes in each. **(4)**

2. (a) Briefly explain the use of the following in shafts:-
   (i) Steps and collars. **(2)**
   (ii) Fillet radii. **(2)**
   (b) Fig. Q. 2(b) is a channel section. Determine the area moment of inertia of the section about c.g. axes parallel and perpendicular to the legs. **(6)**

3. At a point on a solid circular shaft is acting a bending moment of 400 Nm and a twisting moment of 2 kNm. The material of the shaft has a tensile yield strength of 240 MPa.
   (a) Calculate a suitable diameter of the shaft for a factor of safety of 2. **(5)**
   (b) Find the diameter again using the ASME CODE. **(3)**
   (c) Which of the results in (a) and (b) above is conservative? **(2)**

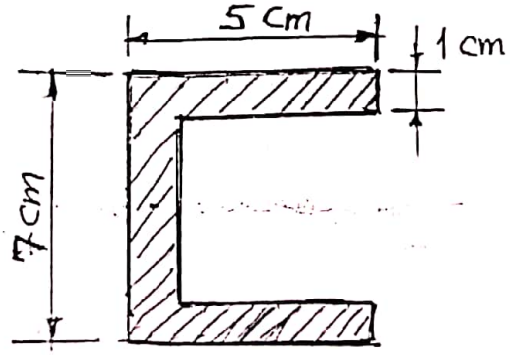

Fig. Q. 2(b)

SECTION A (40 marks)

1. (a) Describe briefly the two main classes of joints and give at least two examples in each. (6)
   (b) Mention four (4) materials used for rivets (2)
   (c) What do you understand by the terms 'cold riveting' and 'hot riveting' as applied to rivets? (4)
   (d) State two advantages and two disadvantages of riveted joints over welded joints. (4)
   (e) Sketch the following riveted joints:-
   i) Triple riveted lap joint (2)
   ii) Double riveted one trapped butt joint (2)
   (f) Provide sketches for the following welded joints and show clearly the preparation of joints:-
   i) Single U-groove butt joint (2)
   ii) Single fillet T-joint with V-seam (2)
   (g) List at least four (4) properties required for shaft materials. (4)
   (h) Mention the two most common types of failure for shafts and state their causes. (4)
   (i) Give sketches for the following pins and state where they are employed:-
   i) Cylindrical pin with chamfered ends (2)
   ii) Cylindrical pin with squared ends (2)
   (j) For what purpose are circlips or seeger rings used? (2)
   (k) Normally 75% of the splines are assumed to transmit the load. WHY? (2)

SECTION B (20 Marks)

2. Two overlapping plates each 10 mm thick, are welded by a fillet weld as shown in fig. Q 2. Dimensions in mm. The joint is subjected to a load P = 120 kN. If allowable shear stress of the weld is 100 MPa, determine the suitable size of the weld. (10)

3. A solid circular shaft is subjected to a twisting moment of 2kNm. Find a suitable diameter if the allowable shear stress of material of the shaft is 60 MPa, and te maximum angle of twist is to be 1^0 per metre length. Take G = 80 GPa for the shaft material. (10)

4. A woodruff key 5 x 6.5 mm is used to key a gear on a 17mm diameter shaft. The key material has allowable bearing and shearing stresses of 360 MPa and 180 MPa respectively. The length of the key is 15.72mm and the keyway depth in the shaft is 4.5mm. Calculate the torque capacity of the key. **Sketch the key.** (10)

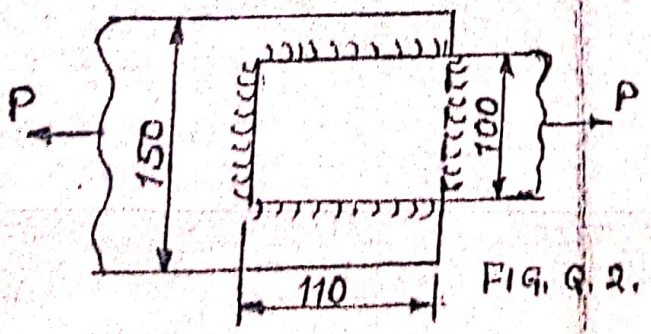

FIG. Q. 2.

DAR ES SALAAM INSTITUTE OF TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
GC 17 ME
MET 04108: TRANSMISSION AND SUSPENSION SYSTEMS.
TEST

Date: May, 2018 Time allowed 1HR

Instructions: Attempt All Four Questions within the question paper

Name: DICKSON LUESS Reg#: 1703303202138

1. Study the diagram in fig. 1 below and attempt the questions below
   1.1 Identify the components labeled a to e
   1.2 Give one function of each component labeled b and c as used in transmission systems.

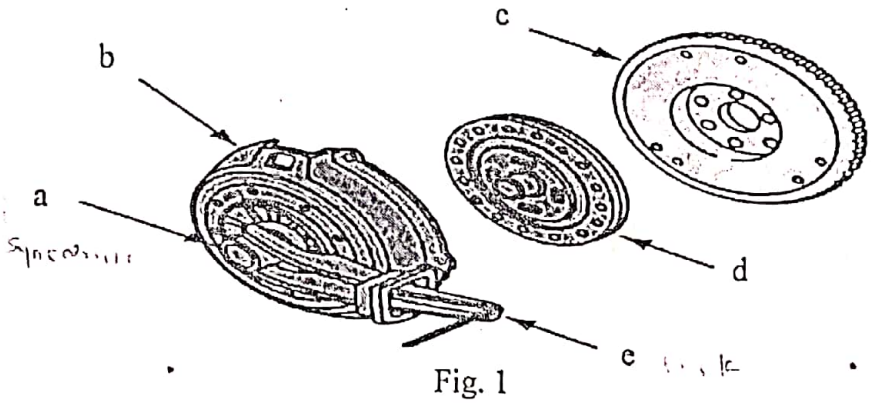

Fig. 1

2. State any four functions of a gearbox in vehicles.
3. With four reasons state why tubular section prop-shafts are normally used in vehicles.
4. With points describe the function of a differential unit in vehicles.

1. (1.1) - (a) synchronizer (b) pressure plate
(c) flywheel (d) Release fork (e) clutch plate

(1.2)

5. (1.2) Function

b (pressure plate)

(i) ~~It used to connect the flywheel~~

(ii) It used to hold the clutch plate [illegible] and connected [illegible]

4

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DAR ES SALAAM INSTITUTE OF TECHNOLOGY
MECHANIAL ENGINEERING DEPARTMENT
SEMESTER II CONTINUOUS ASSESSMENT 2017/2018
MET G5302 BASIC MACHINE ELEMENTS TEST 1
GC 17 ME NTA 6

TIME: 1HOUR TUE. 08TH MAY 2018

INSTRUCTIONS
- Answer all THREE (3) questions.
- Marks are as allocated to each question and parts.

1. (a) List the two main classes of joints and give at least two examples in each. (4)
   (b) Mention four materials used for rivets (2)
   (c) Riveted joints may be classified according to the functions for which they are to serve. State them and mention the method of fastening used to each. (4)

2. (a) State the two main forms of welding processes. (2)
   (b) Sketch a double fillet welded T-Joint with K-seam. Show the joint using weld symbols only. (2)
   (c) Two overlapping plates are welded as shown in fig. Q.2(c) (dimensions in mm). The maximum value of P is 120 kN and the allowable shear stress of the weld is 100Mpa. De termine the minimum size of the weld to be applied. All seams are of the same size. (6)

3. A double riveted, double covered butt joint is as shown in fig. Q.3 (dimensions in mm). 10 rivets each 25mm in diameter are used in the arrangement given. If the allowable stresses for the joint are 70MPa, 90 MPa and 150.MPa in shearing, tensile and crushing failures respectively, determine:-
   (a) The strength of the joint. (6)
   (b) The efficiency of the joint. (4)

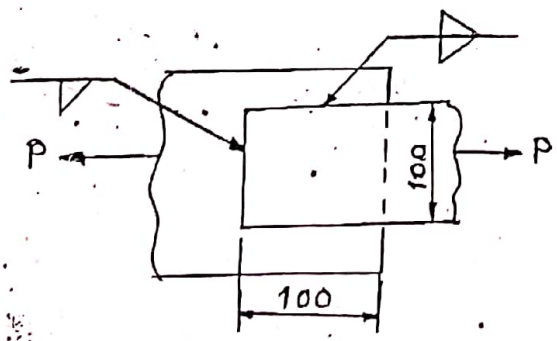

Fig. Q.2 (c)

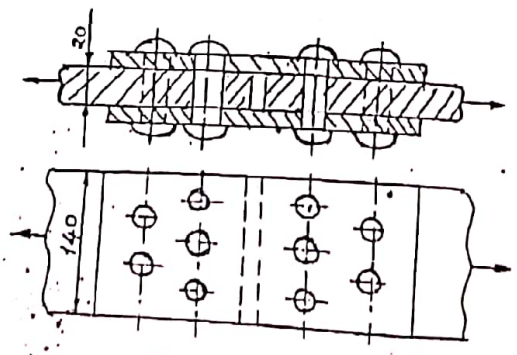

Fig. Q.3.

DAR ES SALAAM INSTITUTE OF TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
SEMESTER II EXAMINATIONS 2018/2019
MET G5302 BASIC MACHINE ELEMENTS
GC 18ME NTA 6
TIME: 2 HOURS _____ JUNE 2019_____

INSTRUCTIONS

1. Follow all instructions written on your answer booklet(s).
2. This paper consists of **SECTION A** of **ONE(1)** question having parts (a) to (l) and **SECTION B** of **THREE(3)** questions.
3. Answer **ALL** questions in section **A** and **ANY TWO (2)** questions in section **B** with **Q.3** included.
4. Marks are as given to each question and parts.
5. Section A carry 40 marks and Section B has 20 marks.
6. Do not write anything on the question paper.
7. Cellular phones and programmable calculators are not allowed in the examination room.
8. Write in blue/black ink and draw in pencil.
9. Write neatly and clearly.

This paper consists of (2) printed pages.

SECTION A (40 marks)

1. (a) Briefly explain the two main classes of joints and give at least two examples in each. **(6)**
   (b) List four types of materials used for rivets. **(2)**
   (c) Give two advantages and two disadvantages of riveted joints. **(4)**
   (d) State the two main forms of welding processes. **(2)**
   (e) Show a double fillet welded T- joint using weld symbols only. **(2)**
   (f) Give sketches for the following riveted joints:-
   (i) Double riveted lap joint. **(2)**
   (ii) Single riveted one strapped butt joint. **(2)**
   (g) Sketch the following welded joints and show clearly the preparation of the joints:-
   (i) Double U- groove butt joint. **(2)**
   (ii) Single fillet T- joint with V-seam. **(2)**
   (h) List at least four properties of materials required for shafts. **(4)**
   (i) Mention the two main types of failure for shafts and state the causes in each. **(4)**
   (j) Why are retaining rings(circlips, Seeger or snap rings) not preferred at areas with high stresses? **(2)**
   (k) Make sketches for the following pins and state the uses of each:-
   (i) Cylindrical pin with rounded ends. **(2)**
   (ii) Cylindrical pin with chamfered ends. **(2)**
   (l) In a splined connection, 75% of the splines are normally assumed to transmit the load. Why? **(2)**

SECTION B (20 marks)

2. A triple riveted double covered butt joint is as shown in fig. Q.2 (dimensions in mm). The joint is to carry a pull of 180 kN. 12 rivets are used in the arrangement given. Determine the suitable diameter of the rivets if the allowable stresses are 70 MPa and 150 MPa in shear and bearing respectively. **(10)**
3. A solid circular shaft is subjected to a twisting moment of 2 kNm. Find a suitable diameter of the shaft if the allowable shear stress of the material is 60 MPa and the maximum angle of twist is to be 1° per meter length. Take G=80 GPa for the material. **(10)**
4. A Woodruff key 5x6.5 mm is used to key a gear on a 17 mm diameter shaft made of steel. Allowable bearing and shearing stresses for the key material are 352 MPa and 176 MPa respectively. Determine the torque capacity of the key if the keyway depth in the shaft is 4.5 mm. Take the length of the key as 15.72 mm. **(10)**

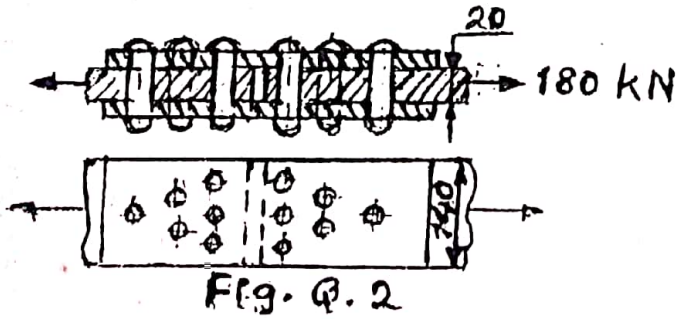

Fig. Q. 2

DAR ES SALAAM INSTITUTE OF TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
SEMESTER II CONTINUOUS ASSESSMENT 2018/2019
MET G5302 BASIC MACHINE ELEMENTS
GC 18ME NTA 6 TEST NO:1
TIME: 1 HOUR SUN. 16TH JUNE 2019.

INSTRUCTIONS

- Answer **ALL THREE(3)** questions.
- Marks are as given to each question and parts.

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1. (a) State the two main classes of joints and mention at least two examples in each. **(4)**
   (b) Riveted joints may be classified according to the functions for which they are to serve. List them and for each mention the method of fastening used. **(4)**
   (c) List the two main forms of welding processes. **(2)**
   (d) Give a sketch of a single fillet welded T- joint using weld symbols only. **(2)**
2. A triple riveted double covered butt joint is as shown in fig. Q.2. The joint is to carry a pull of 180 kN. 12 rivets are to be used in the arrangement given. Determine the suitable diameter of the rivets. Allowable stresses are 70 MPa and 150 MPa in shear and crushing respectively. Dimensions are in mm. **(8)**

3. (a) Give at least two advantages and two disadvantages of welded joints. **(4)**
   (b) Determine the size of the fillet weld to be applied for the joint shown in fig. Q.3.(Dimensions in mm). The maximum value of P is 120 kN. Allowable shear stress of the weld is 100 MPa. **(6)**

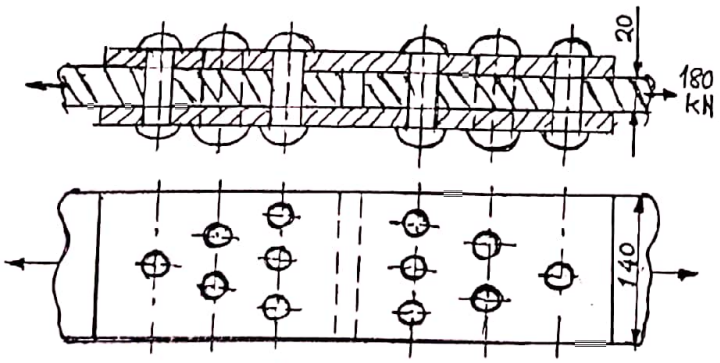

Fig. Q.2

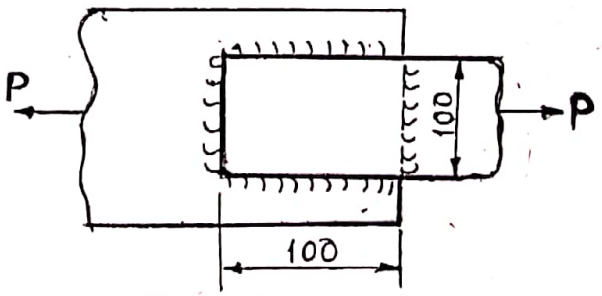

Fig. Q.3

DAR ES SALAAM INSTITUTE OF TECHNOLOGY
MECHANICAL ENGINEERING DEPARTMENT
SEMESTER I CONTINUOUS ASSESSMENT 2012/2013
MET 05102 BASIC MACHINE ELEMENTS TEST NO: 2

TIME: 1½ HOURS — THUR. 24TH JAN. 2013

INSTRUCTIONS
- Answer ALL THREE (3) questions.
- Marks are as allocated to questions.

1. (a) Differentiate between a shaft and an axle. (4)

(b) What is a spindle? (2)

(c) List at least four (4) properties of materials required for shafts. (4)

2. (a) Explain briefly the two most common types of failure for shafts. (4)

(b) State the purpose of the following design features found on shafts:-

(i) Steps and collars (3)

(ii) Fillets and groove radii. (3)

3. At a certain point on a solid circular shaft is acting a bending moment of 400 Nm and a twisting moment of 2 kNm, and at another point the bending moment and twisting moment are 800 Nm and 1.6 kNm respectively. The material of the shaft has an allowable shear stress of 80 MPa. Determine the minimum required diameter at the critically loaded point. (10)

DAR ES SALAAM INSTITUTE OF TECHNOLOGY

MECHANICAL ENGINEERING DEPARTMENT

SEMESTER I CONTINUOUS ASSESSMENT 2012/2013

MECHANICAL BASIC M/C ELEMENTS TEST NO. 1

OD 11 M NTA 5

TIME: 1½ HOURS THURSDAY 10TH JAN. 2013

INSTRUCTIONS

- Answer all three (3) questions
- Marks are as allocated to each question

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1. (a) State the two main classes of joints and give at least two examples in each.

(b) Riveted joints may be classified according to the purpose served. List them and state the type of joining used to each.

(c) Mention the four types of materials used for reverts.

2. (a) State the two main forms of welding processes.

(b) Give sketches for the following riveted joints:-
(i) Triple riveted lap joint.
(ii) Double riveted, single cover butt joint. (2

(c) Provide sketches for the following welding joints and where possible show clearly the preparation of the joint:-
(i) Double filled T-joint with K-seam (2
(ii) Double V-grooved butt joint (2

3. A double riveted single covered butt joint is made with rivets of 25mm diameter in a pitch of 80mm. The thickness of the main plates is 20mm. Allowable stresses are 120 MPa, 100 MPa and 150 MPa in tension, shear and crushing/bearing respectively.

(a) Sketch the joint. (2)
(b) Find the strength of the joint per pitch length. (4)
(c) What is the efficiency of the joint? (4)

Take the thickness of the cover plate to as tc = (5t)/8

where t = thickness of main plate