Student's Assessment Number.....

THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

FORM TWO NATIONAL ASSESSMENT

090 MECHANICAL ENGINEERING

Time: 2:30 Hours **Year: 2015**

Instructions

1. This paper consists of Section **A, B** and **C** with a total of **eight (8)** questions
2. Answer **al**l questions in section **A** and **B,** and one question from section C.
3. Section **A** carries **ten (10)** marks, section **B** carries **thirty (30)** marks and Section C carries **sixty (60)** marks.
4. Cellular phones and unauthorized materials are not allowed in the assessment room
5. Write your **Examination Number** at the top right-hand corner of every page.

FOR ASSESSOR'S USE ONLY		
QUESTION NUMBER	**SCORE**	**ASSESSOR'S INITIALS**
1		
2		
3		
4		
5		
6		
7		
8		
TOTAL		
CHECKER'S INITIALS		

Student's Assessment Number.....

SECTION A (10 MARKS)

Answer **all** questions in this section.

1. For items (i) – (v) Choose the correct answer for each item from the given four alternatives and write its letter in the box provided.

(i) Identify the part of the blast furnace at which the highest temperature occurs.
- A. Throat
- B. Bosh
- C. Hearth
- D. Hopper

(ii) Identify the property of rubber which allows it to be used for vibration dampers of machines.
- A. Ductility property
- B. Tenacity property
- C. Malleability proper
- D. Elastic property

(iii) identify the group of instruments under which a divider falls.
- A. Drawing tools
- B. Measuring tools
- C. Marking tools
- D. Measuring instruments

(iv) Which tool is mainly used to measure the diameter of a cylindrical object?
- A. Vernier calliper
- B. Screwdriver
- C. Hammer
- D. Hacksaw

(v) Which property of a material defines its ability to withstand sudden shocks without breaking?
- A. Hardness
- B. Toughness
- C. Elasticity
- D. Ductility

2. Match each item in **list A** with a correct response in **list B** by writing its letter below the number of the corresponding item in the table provided.

LIST A	**LIST B**
(i) A material which improves machinability of steel (ii) A metal which have the ability of cutting other metals. (iii) A material which is suitable for the manufacture of chemical containers. (iv) A non-metal used to improve the hardness of steel (v) Used for production of pig iron	A. Nonferrous metal B. Blast furnace C. Carbon D. Ductility E. Plastic F. Copper G. Nodular iron H. HSS

List A	(i)	(ii)	(iii)	(iv)	(v)
List B					

SECTION B (30 MARKS)

Answer **all** questions in this section.

3. (a) (i) mention five main uses of copper

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(ii) list five elements which are used for production of alloy steel.

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(b) (i) state five characteristics of a good lubricant.

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(ii) name two materials which are commonly used to make hacksaw blades

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(iii) mention the ores from which aluminium, zinc and lead are extracted.

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(c) (i) explain with the aid of sketches the difference between a square bar and a square pipe

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(ii) define the terms 'pig iron', 'ingot' and 'cementite'.

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SECTION C (60 MARKS)

Answer **one** question from this section.

4. (a) (i) Show by means of a sketch how a try square is used to produce parallel lines on work piece.

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(ii) Outline four operations which can be done using a lathe machine.

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(iii) Give three methods on how the drill is held and three on how the work is held when drilling.

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(b) (i) Define the terms cutting speed and feed as used in relation to turning operations.

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(ii) Explain the function of chuck, tailstock, carriage and tool post of the lathe machine.

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(iii) Name three taps comprised in a set of hand taps.

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(c) (i) Differentiate between single cut file and double cut file, cross filling and draw filling.

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(ii) List four types of chisels.

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(iii) Write four general causes of accidents in a fitting and turning workshop.

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5. (a) (i) state two functions of the welding regulators and welding touch,

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(ii) give four precautions to be taken in storing oxygen and acetylene cylinders

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(iii) state the four functions of the soldering flux.

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(b) (i) write two examples of permanent joints and four examples of temporary joints

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(ii) identify the colour codes given for the cylinders carrying acetylene, propane, oxygen gases.

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(iii) differentiate between low pressure welding system and high-pressure welding system.

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(c) (i) name five tools used in arc welding.

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(ii) define the terms fusion welding, tack welding and resistance welding

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(iii) differentiate between carburizing flame and oxidizing flame by using sketches and give one use for each.

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6. (a) (i) give the number of revolutions a crankshaft makes in order to complete one cycle for a two strokes cycle engine and for a four strokes cycle engine.

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(ii) explain what happens in a cylinder of a diesel engine during compression stroke,

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(iii) mention four parts in the engine which rotate when the engine is working

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(iv) write four advantages of a two-stroke compression ignition engine over a four stroke compression ignition engine.

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(b) (i) state engine classification according to fuel, cooling and ignition system and give two classes in each case

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(ii) write three functions of an engine flywheel

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(iii) list four main components of the fuel supply system of a compression ignition engine.

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(c) (i) calculate the volume of the combustion chamber if a petrol engine has a cylinder bore of 95 mm and a stroke of 120 mm and the compression ratio is 9 to 1

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(ii) explain the meaning of thermal efficiency, firing order, combustion and carburation.

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7. (a) (i) define the terms: generator, insulator and e.m.f.

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(ii) identify the type of battery which is mostly used in automobiles

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(iii) state the functions of spark plug, condenser, ignition coil, alternator and contact breaker point.

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(b) (i) mention four main electric circuits of a car

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(ii) calculate the equivalent resistance, the total current flowing in the circuit and the voltage across each resistor, given three resistors of 2, 3 and 4 ohms which are connected in parallel to a battery of 12 volts.

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(c) (i) define the term 'relay' as used in auto electrics.

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(ii) name five parts of the ignition coil.

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(iii) identify the names of components represented by the given symbols.
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8. (a) (i) define the terms heat and pressure,
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(ii) name two instruments which are used to measure temperature
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(iii) mention four methods which are used to preserve foods apart from refrigerators
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(iv) convert -20 ^{0}C and 35 ^{0}C to kelvin scale.
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(b) (i) state Boyle's law of gases,
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(ii) define the term secondary refrigerant
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(iii) define the terms: air conditioning, humidity, pressure and psychrometer.
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(c) (i) mention five places where air conditioning systems are commonly used
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(ii) write the purpose of using a spanner, hacksaw, pinch off tool, flaring tool, pliers and tongs in refrigeration and air conditioning.