**MCHT**



# ISEBE LEMFUNDO LEMPUMA KOLONI

EASTERN CAPE EDUCATION DEPARTMENT

OOS-KAAP ONDERWYSDEPARTEMENT

IIMVIWO ZEBANGA LOKUGQIBELA

NATIONAL SENIOR CERTIFICATE EXAMINATIONS

NASIONALE SENIOR SERTIFIKAAT-EKSAMEN

### SEPTEMBER 2009

|  |
| --- |
| **MECHANICAL TECHNOLOGY** |

##### IXESHA: 3 iiyure TIME: 3 hours TYD: 3 uur

**AMANQAKU: 200 MARKS: 200 PUNTE: 200**

*Write on the cover of your answer book, after the word “Subject” –*

**MECHANICAL TECHNOLOGY**

This question paper consists of 19 pages, an answer sheet and 5-page formula sheet.

|  |  |
| --- | --- |
| **INSTRUCTIONS AND INFORMATION** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 1. | Answer ALL the questions. | |  |
|  |  |  |  |
| 2. | Read ALL the questions carefully. | |  |
|  |  |  |  |
| 3. | Number the answers correctly according to the numbering system used in this question paper. | |  |
|  |  |  |  |
| 4. | Write neatly and legibly. | |  |
|  |  |  |  |
| 5. | A formula sheet is attached to this paper. | |  |
|  |  |  |  |
| 6. | Show ALL calculations and units. Round answers off to TWO decimal places. | |  |
|  |  |  |  |
| 7. | Candidates may use non-programmable scientific calculators and drawing instruments. | |  |
|  |  |  |  |
| 8. | The value of the gravitational force should be taken as 10 m/s2. | |  |
|  |  |  |  |
| 9. | Use the criteria below to assist you in managing your time. | |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **QUESTION** | **ASSESSMENT STANDARDS** | **CONTENT COVERED** | **MARKS** | **TIME** |
| 1 | 1 – 9 | Multiple-choice questions | 20 | 15 minutes |
| 2 | 6 and 8 | Forces and systems and control | 50 | 55 minutes |
| 3 | 2 | Tools and equipment | 20 | 15 minutes |
| 4 | 3 | Materials | 20 | 15 minutes |
| 5 | 1, 4 and 5 | Safety, terminology and joining methods | 50 | 45 minutes |
| 6 | 7 and 9 | Maintenance and turbines | 40 | 35 minutes |
|  | | **TOTAL** | **200** | **180 minutes** |

|  |  |
| --- | --- |
| **QUESTION 1: MULTIPLE-CHOICE QUESTIONS** |  |

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| --- | --- |
| **(LEARNING OUTCOME 3: ASSESSMENT STANDARDS 1 – 9)** |  |

|  |  |
| --- | --- |
| Various possible options are provided as answers to the following questions.  Choose the answer and write only the letter (A – D) next to the questions. |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 1.1 | Which of the safety precautions should be observe during arc-welding  so to prevent fire or explosion from welding sparks? | |  |
|  |  |  |  |
|  | A | Keep cables, material, tool neatly organised. |  |
|  | B | Provide non-flammable shielding to protect others. |  |
|  | C | Keep a fire extinguisher in the welding area. |  |
|  | D | The welder should be insulated to avoid electrocution. | (1) |
|  |  |  |  |
| 1.2 | Which of the following equipment do we use to test the compression  of an internal combustion engine? | |  |
|  |  |  |  |
|  | A | Torsion tester |  |
|  | B | Rockwell tester |  |
|  | C | Pressure tester |  |
|  | D | Tensile tester | (1) |
|  |  |  |  |
| 1.3 | Identify the engineering equipment shown in FIGURE 1.1. | |  |
|  |  |  |  |
|  | C:\Documents and Settings\exams\My Documents\My Pictures\Mectec1-Sept09.bmp | |  |
|  |  | **FIGURE 1.1** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | Gas analyser |  |
|  | B | Spring tester |  |
|  | C | Dial tester |  |
|  | D | Cylinder leakage tester | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
| 1.4 | Identify the joint representation as shown in FIGURE 1.2 below  used in welding. | |  |
|  |  |  |  |
|  | MECHANICAL TECH 07 | |  |
|  |  | **FIGURE.1.2** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | A single V-butt joint. |  |
|  | B | A double butt joint |  |
|  | C | A fillet joint |  |
|  | D | A square butt joint | (1) |
|  |  |  |  |
| 1.5 | Solder is an alloy of … | |  |
|  |  |  |  |
|  | A | lead and tin. |  |
|  | B | copper and zinc. |  |
|  | C | copper and tin. |  |
|  | D | copper and lead. | (1) |
|  |  |  |  |
| 1.6 | What is the common use of carbon fibre as a thermosetting plastic? | |  |
|  |  |  |  |
|  | A | Forgings |  |
|  | B | Bearings |  |
|  | C | Racing bicycle frames |  |
|  | D | Valves | (1) |
|  |  |  |  |
| 1.7 | Identify the thermo plastics used in the production of water bottles. | |  |
|  |  |  |  |
|  | A | Polyamide (nylon) |  |
|  | B | Polyurethane |  |
|  | C | Polythene |  |
|  | D | Tefnol (re-inforced plastic) | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
| 1.8 | Identify the type of milling cutter shown in FIGURE 1.3. | |  |
|  |  | |  |
|  |  | |  |
|  |  | **FIGURE 1.3** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | Slotting cutter |  |
|  | B | Side and face cutter |  |
|  | C | Concave cutter |  |
|  | D | T-slot cutter | (1) |
|  |  |  |  |
| 1.9 | What does the symbol in FIGURE 1.4, relates to in a hydraulic system? | |  |
|  |  | |  |
|  |  | |  |
|  |  | **FIGURE 1.4** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | Valve |  |
|  | B | Filter |  |
|  | C | Compressor |  |
|  | D | Motor | (1) |
|  |  |  |  |
| 1.10 | What is the purpose of a Nick-break test? | |  |
|  |  |  |  |
|  | A | Breaking the weld open for examination of external defects. |  |
|  | B | To test the strength of the weld metal. |  |
|  | C | Checking of a shear fracture of a weld. |  |
|  | D | Checking the high-frequency sound effect of a weld. | (1) |
|  |  |  |  |
| 1.11 | The definition for the term undercutting which may occur during the welding  process: | |  |
|  |  |  |  |
|  | A | Holes which occur in the weld metal due to trapped gases. |  |
|  | B | Small pinholes which occur in the weld metal. |  |
|  | C | Occurs as a cavity at the end of the weld. |  |
|  | D | A groove melted into the base metal adjacent to the edge of a weld. | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
| 1.12 | What is understood by SHEARING stress? | |  |
|  |  |  |  |
|  | A | An internal force present in a material resisting a compressive load. |  |
|  | B | An internal load acting on a matter. |  |
|  | C | An Internal force in a material which resist a shearing load between  two planes. |  |
|  | D | A force in a material resisting a load. | (1) |
|  |  |  |  |
| 1.13 | Determine the stress when two plates 10 mm thick and 40 mm wide  riveted together, using 16 mm diameter rivets as shown in, FIGURE 1.5, if a load of 90 kN is applied to the plate? | |  |
|  |  | |  |
|  |  | |  |
|  | **FIGURE 1.5** | |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | 447,623 N / mm2 |  |
|  | B | 447,1 N / mm2 |  |
|  | C | 477,33 N / mm2 |  |
|  | D | 433,33 N / mm2 | (1) |
|  |  |  |  |
| 1.14 | What type of stress is acting on the bolt of the knuckle joint shown below? | |  |
|  |  | |  |
|  | MECHANICAL TECH 06 | |  |
|  |  | **FIGURE 1.6** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | Shear stress |  |
|  | B | Compression stress |  |
|  | C | Tensile stress |  |
|  | D | Safe stress | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
| 1.15 | What does point B denote in the stress/strain diagram shown in FIGURE 1.7? | |  |
|  |  | |  |
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|  |  | **FIGURE 1.7** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | A | Maximum stress |  |
|  | B | Limit of proportionality |  |
|  | C | Yield point |  |
|  | D | Elastic limit | (1) |
|  |  |  |  |
| 1.16 | Which one of the following descriptions does NOT indicate the desired property of a cutting fluid? | |  |
|  |  |  |  |
|  | A | Acts as a lubricant. |  |
|  | B | Keeps the cutting tool cool. |  |
|  | C | Gives the cutting tool a longer life span. |  |
|  | D | Causes the machine to rust. | (1) |
|  |  |  |  |
| 1.17 | Which of the following is NOT a purpose or function of the supercharger? | |  |
|  |  |  |  |
|  | A | To create a pressure lower than atmospheric pressure. |  |
|  | B | To increase the compression pressure in the cylinders. |  |
|  | C | To increase the engine power between 30 % and 40 %. |  |
|  | D | To increase the volumetric efficiency of the engine. | (1) |
|  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 1.18 | Determine the gear ratio of the following compound system, if the driving gear (1), with 15 teeth, idler 20 teeth and driven gear with 30 teeth, is as shown below. | |  |
|  |  | |  |
|  | untitled | |  |
|  |  | **FIGURE 1.8** |  |

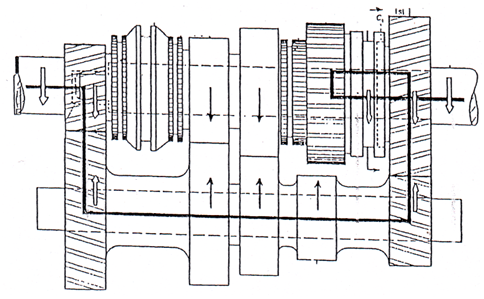
|  |  |  |  |
| --- | --- | --- | --- |
|  | A | 1:1 |  |
|  | B | 1:2 |  |
|  | C | 3:1 |  |
|  | D | 2:1 | (1) |
|  |  |  |  |
| 1.19 | What is the function of the conventional ignition system in a vehicle? | |  |
|  |  |  |  |
|  | A | To provide a spark across each spark plug. |  |
|  | B | Supply more current to the battery for charging purpose. |  |
|  | C | To regulate the fuel supply to the cylinders. |  |
|  | D | To adjust the ignition timing. | (1) |
|  |  |  |  |
| 1.20 | Which of the following superchargers are the most efficient and common of all force-induction systems? | |  |
|  |  |  |  |
|  | A | Centrifugal supercharger |  |
|  | B | Vane supercharger |  |
|  | C | Rotor supercharger |  |
|  | D | Plunger pump | (1) |
|  |  |  | **[20]** |

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| **QUESTION 2: FORCES AND SYSTEMS AND CONTROL** |  |

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| **(LEARNING OUTCOME 3: ASSESSMENT STANDARDS 6 AND 8)** |  |

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| --- | --- | --- |
| 2.1 | Mr Normani is required to modify his four speed gearbox, the gearbox consist of a spigot gear with 18 teeth, third gear with 26 teeth, second gear with 32 teeth and a first gear with 36 teeth. It also has a lay-shaft with 38, 34, 28, and 22 teeth respectively. If the speed of the spigot shaft is 3 000 rpm, and the torque applied to it is 150 Nm. |  |

**4th gear 1st gear**

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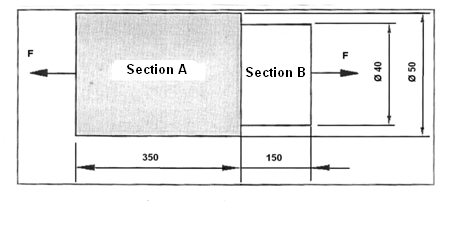
|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **FIGURE 2.1** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2.1.1 | Calculate the gear ratio if first gear is selected. | (3) |
|  |  |  |  |
|  | 2.1.2 | Calculate the speed of the output shaft if first gear is engaged. | (2) |
|  |  |  |  |
|  | 2.1.3 | Calculate the actual torque transmitted if first gear is selected. | (1) |
|  |  |  |  |
| 2.2 | A farmer approach your engineering company to help in setting up a  production line, the following information was given by the farmer:   * Centre distance between the two pulleys is 550 mm * Diameter of the driving pulley is 220 mm * Diameter of the driven pulley is 110 mm | |  |
|  |  |  |  |
|  | 2.2.1 | Calculate the open flat belt drive needed for the production line. | (3) |
|  |  |  |  |
|  | 2.2.2 | Calculate the cross belt drive needed for the production line**.** | (3) |
|  |  |  |  |
|  | 2.2.3 | Which of the drive systems would you recommend to the farmer if  less slipping is required? Motivate your answer. | (1) |

|  |  |  |  |
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| 2.3 | A single friction clutch plate is used to transmit power on a pump with an effective diameter of 0,16 m. The clutch plate has a friction material on both sides with a friction co-efficient of 0,35. The total applied force on the pressure plate is 3,2 Kn.  Calculate: | |  |
|  |  |  |  |
|  | 2.3.1 | The maximum torque transmitted. | (2) |
|  |  |  |  |
|  | 2.3.2 | Power transmitted at a speed of 2800 rpm in Kw. | (2) |
|  |  |  |  |
| 2.4 | The Buffalo Municipality earth moving grader broke down on a excavating  site. A three start square thread with a crest diameter of 66 mm and a lead  of 33 mm is to be cut on a centre lathe so to repair the hydraulic arm on  the earth moving grader Assume a clearance angle for cutting tool of 3º. | |  |
|  |  | |  |
|  |  | |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Calculate the following: | | |  |
|  |  |  |  |
|  | 2.4.1 | The helix angle of the thread. | (3) |
|  |  |  |  |
|  | 2.4.2 | The leading tool angle | (2) |
|  |  |  |  |
|  | 2.4.3 | The trailing tool angle | (2) |
|  |  |  |  |

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| --- | --- | --- |
| 2.5 | During the planting season a farmer experienced a problem with his plough. The stepped pin holding the blade to the frame was broken. He requires a new pin that can carry a load of 150 kN. You have decided to design a stepped pin made of brass with dimensions as shown in FIGURE 2.2. |  |

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| --- | --- | --- | --- |
|  |  | **FIGURE 2.2** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2.5.1 | Calculate the total original length of the stepped pin. | (2) |
|  |  |  |  |
|  | 2.5.2 | Calculate the stress in Section A and in Section B caused by a  150 kN load. | (6) |
|  |  |  |  |
|  | 2.5.3 | Calculate the strain induced in Section A and in Section B.  Take Young’s Modulus of Elasticity for brass as 80 Gpa. | (2) |
|  |  |  |  |
|  | 2.5.4 | Calculate the total final length of the pin after the load was applied  to it. | (5) |
|  |  |  |  |

|  |  |  |  |
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| 2.6 | Mrs Pedro has started a new Technology workshop which requires a  hydraulic press that will be used in the processing department.  The drawing below illustrated the hydraulic press to be used.  A force applied on piston A induces a force of 450 N on piston B  of the hydraulic press. This causes piston B to move 12 mm upwards.  The diameter of piston A is 150 mm and piston B is 750 mm. SEE FIG. 2.3. | |  |
|  |  | |  |
|  | Mech Tec pic.bmp | |  |
|  |  | **FIGURE 2.3** |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 2.6.1 | Calculate the force applied on piston A. | (6) |
|  |  |  |  |
|  | 2.6.2 | Calculate the volume display by piston B. | (2) |
|  |  |  |  |
|  | 2.6.3 | Calculate the distance piston A moved downwards in mm. | (2) |
|  |  |  | **[50]** |

|  |  |
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| **QUESTION 3:** **TOOLS AND EQUIPMENT** |  |

|  |  |
| --- | --- |
| **(LEARNING OUTCOME 3: ASSESSMENT STANDARD 2)** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 3.1 | The drawing below in FIGURE 3.1 shows a spring tester, used for testing the  properties of a tension spring. Label the drawing 1 – 5. | |  |
|  |  | |  |
|  |  | |  |
|  |  | **FIGURE 3.1** | (5) |

|  |  |  |  |
| --- | --- | --- | --- |
| 3.2 | The lathe consists of different components, which play an important function. | |  |
|  |  | |  |
|  | MECHANICAL TECH 04 | |  |
|  |  | **FIGURE 3.2** |  |

|  |  |  |
| --- | --- | --- |
| 3.3 | Identify the sketch and write down THREE functions of the component in FIGURE 3.2. | (4) |

|  |  |  |
| --- | --- | --- |
| 3.4 | The learner has been instructed to diagnose why the headlights of the motor vehicle belonging to the principal of the school are not functioning. Explain step-by-step how to do a continuity testing using a multi-meter. | (5) |

|  |  |  |
| --- | --- | --- |
| 3.5 | Distinguish between the similarities and differences of a pressure  tester and a cylinder leakage tester (for internal combustion engines). | (6) |
|  |  | **[20]** |

|  |  |
| --- | --- |
| **QUESTION 4: MATERIALS** |  |

|  |  |
| --- | --- |
| **(LEARNING OUTCOME 3: ASSESSMENT STANDARD 3)** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 4.1 | Define the following terms as applicable to engineering materials: | |  |
|  |  |  |  |
|  | 4.1.1 | Non-ferrous alloys | (2) |
|  |  |  |  |
|  | 4.1.2 | Composites | (2) |
|  |  |  |  |
| 4.2 | You are a designer and are required to use various engineering materials in your projects. In tabulated form, compare TWO properties and TWO uses of the following engineering materials.  Example: | |  |
|  |  |  |  |

|  |  |  |
| --- | --- | --- |
| **MATERIAL** | **PROPERTY** | **USES** |
| Copper | Ductile | Electrical cables |

|  |  |  |
| --- | --- | --- |
| 4.2.1 | White metal | (4) |
|  |  |  |
| 4.2.2 | Vanadium | (4) |
|  |  |  |
| 4.2.3 | Nylon | (4) |

|  |  |  |
| --- | --- | --- |
| 4.3 | Some door hinges are made of mild steel while others are fabricated  from brass. Mild steel has a lower density than brass and it is cheaper.  Why would you rather choose brass than mild steel if you were to build  a house? | (4) |
|  |  | **[20]** |

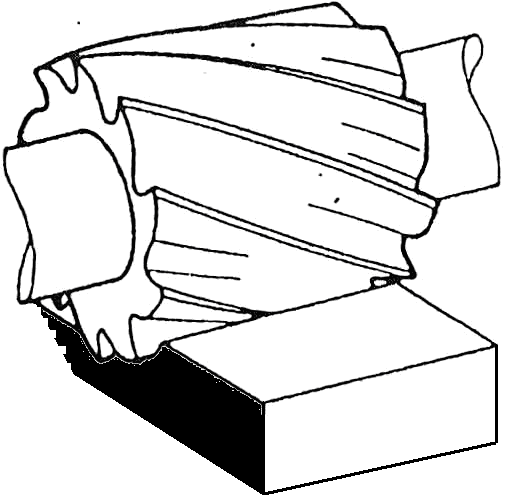
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| --- | --- |
| **QUESTION 5: SAFETY, TERMINOLOGY AND JOINING METHODS** |  |

|  |  |
| --- | --- |
| **(LEARNING OUTCOME 3: ASSESSMENT STANDARDS 1, 4 AND 5)** |  |

|  |  |  |
| --- | --- | --- |
| 5.1 | Jan has to turn a stepped shaft using a centre lathe. He needs to adhere to certain safety measures. State FIVE safety measures that Jan has to adhere to when using the centre lathe. | (5) |

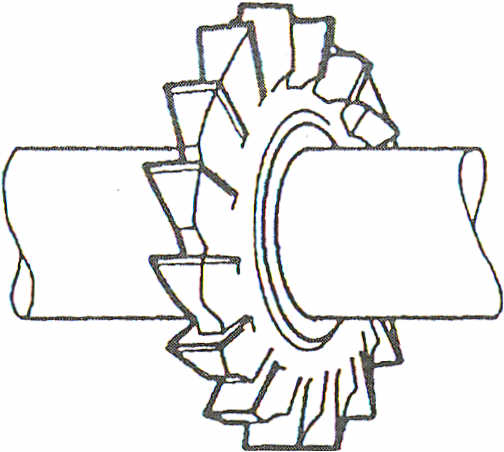
|  |  |  |
| --- | --- | --- |
| 5.2 | You are given a task by your supervisor to the use the MAGS/MIGS welding machine, to weld mild steel sheets. List FOUR precautions you would take when welding using the MAGS/MIGS welding machine. | (4) |

|  |  |  |  |
| --- | --- | --- | --- |
| 5.3 | Sipho has to use various milling cutters to make a gearbox casing.  Help him to identify the various cutters shown below. | |  |
|  |  | |  |
|  | 5.3.1 |  |  |



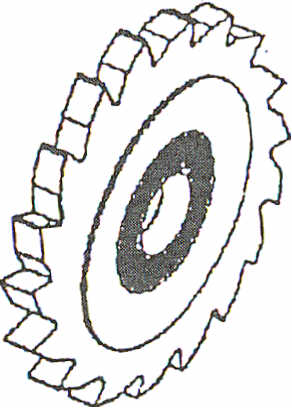
|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **FIGURE 5.1** | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 5.3.2 |  |  |



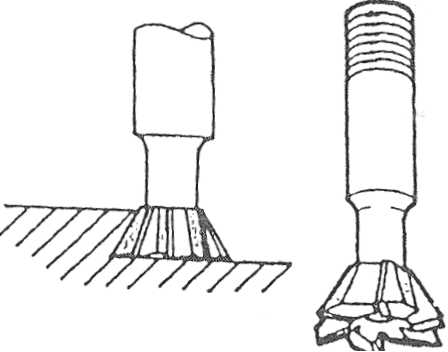
|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **FIGURE 5.2** | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 5.3.3 |  |  |



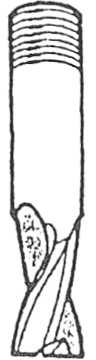
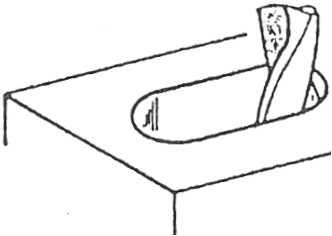
|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **FIGURE 5.3** | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 5.3.4 |  |  |



|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **FIGURE 5.4** | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
|  | 5.3.5 |  |  |



|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **FIGURE 5.5** | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
| 5.4 | Shaamez is a car rental owner and he is having a problem with the gearbox of one of his eyes. When the mechanics strip the gearbox, it is found that one of the gears is broken. You are instructed to manufacture the gear for him. The gear has 87 teeth. | |  |
|  |  |  |  |
|  | 5.4.1 | Calculate the indexing (HINT: Use 86 divisions.) | (3) |
|  |  |  |  |
|  | 5.4.2 | Calculate the change gears for the dividing head. | (6) |
|  |  |  |  |
|  | 5.4.3 | What is the meaning of the positive (+) sign or the negative (–)  sign for the change gears? | (4) |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 5.5 | Nick needs to set up the milling machine. The diameter of the cutter is  80 mm with 16 teeth operating at a cutting speed of 25 meters per minute and a feed of 0,04 mm per tooth. Calculate the feed in lifters per minute. | | (6) |
|  |  |  |  |
| 5.6 | Bruce, a quality controller, received a welded joint for examination/inspection. He makes use of a liquid dye penetrate test to determine whether the weld has any defects. Explain the procedure to be followed. | | (6) |
|  |  |  |  |
| 5.7 | Give TWO reasons why destructive tests are carried out on welded joints. | | (2) |
|  |  | |  |
|  | scan0020 | |  |

|  |  |  |
| --- | --- | --- |
| 5.8 | WELDING:  Mpilo is a welding instructor. He illustrates to his learners the type of defects found in weld processes. Specify THREE possible weld defects that can occur in welded joints and state ONE cause and ONE remedy for each defect. | (9) |
|  |  | **[50]** |

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| **QUESTION 6:**  **MAINTENANCE AND TURBINES** |  |

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| **(LEARNING OUTCOME 3: ASSESSMENT STANDARDS 7 AND 9)** |  |

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| --- | --- | --- | --- |
| 6.1 | Lubrication is very important in the lifespan of an engine.  The oil is used to obtain maximum life and endurance of a machine. | |  |
|  |  |  |  |
|  | 6.1.1 | List the FOUR needs that lubricating oil must fulfil. | (4) |
|  |  |  |  |
| 6.2 | Most of the taxi operators do not have a maintain plan, which result in bearing failure or any other mechanical failures. | |  |
|  |  |  |  |
|  | 6.2.1 | State FOUR reasons for bearings failure in a vehicle. | (4) |
|  |  |  |  |
| 6.3 | Name FOUR performance indicators of gear oil. | | (4) |

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| 6.4 | A Grade 12 learner was instructed to carry out a gearbox oil change.  Describe the procedure for draining old gearbox oil and filling the gearbox with new oil. | | (10) |
|  |  | |  |
|  | untitled | |  |

|  |  |  |
| --- | --- | --- |
| 6.5 | The diagram below shows a sectional view of a two-stroke engine equipped  with a blower. Study the sketch and answer the questions below. |  |
|  |  |  |
|  | untitled1 |  |

**FIGURE 6.1**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 6.5.1 | Name the type of blower attached to the engine in FIGURE 6.1. | (1) |
|  |  |  |  |
|  | 6.5.2 | Label the parts numbered 1 – 6. | (6) |

|  |  |  |  |
| --- | --- | --- | --- |
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| 6.6 | A friend of yours has decided to increase his car’s engine output by fitting a blower to his engine. FIGURE 6.2 shows a type of blower that he would like to use. | |  |
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|  | MECHANICAL TECH 01 | |  |

**FIGURE 6.2**

|  |  |  |  |
| --- | --- | --- | --- |
|  | 6.6.1 | Identify the type of blower illustrated in FIGURE 6.2. | (1) |
|  |  |  |  |
|  | 6.6.2 | Label the sketch from 1 to 4. | (4) |
|  |  |  |  |
|  | 6.6.3 | State TWO advantages of this type of blower. | (2) |
|  |  |  |  |
| 6.7 | Explain what is understood by the term corrosion and rust resistance  of oil and viscosity. | | (4) |
|  |  | | **[40]** |
|  |  | |  |
|  | **GRAND TOTAL: 200** | | |