ADVANCED LEVEL NATIONAL EXAMINATIONS, 2014
TECHNICAL AND PROFESSIONAL TRADES

EXAM TITLE: MTE – Maintenance Technology

OPTION: General Mechanics (GME)

DURATION: 3 hours

INSTRUCTIONS:

The paper is composed of three (3) main Sections:

Section I: Thirteen (13) questions, all Compulsory. 55 marks

Section II: Five (5) questions, Choose any Three (3). 30 marks

Section III: Three (3) questions, Choose any One (1). 15 marks
SECTION I. THIRTEEN (13) COMPULSORY QUESTIONS.

01. Define the following properties of lubricants:
    (a) Pour point
    (b) Oiliness

02. Give the functions of a check valve in a pneumatic circuit.

03. Determine the module and number of teeth of a gear having the dedendum diameter of 273.5mm and pitch diameter of 298mm.

04. List the standard elements specifying the fasteners.

05. Name the labelled components of a ball bearing.

06. Give two reasons why pressure control valves are used in hydraulic systems.

07. What is the major difference between an external gear pump and an internal one?

08. List six items of information which should be marked on an air receive.

09. Give two reasons why pressure control valves are used in hydraulic systems.

10. What is Maintenance? Mention different types of maintenance.

11. Calculate the pipe size to carry an air flow rate of 20litres/s at a velocity of 8.7m/s.

12. Mention four maintenance problems that service men discover most often when answering a customer’s complaints.

13. List four common types of pump faults.
SECTION II. CHOOSE AND ANSWER ANY THREE (3) QUESTIONS.

14. Discuss any ten (10) chief properties to be considered in selecting oil for lubrication.  
10marks

15. Discuss the effects in hydraulics that can be caused by:
   a) Dirty oil  
   b) Foaming oil  
10marks

16. Give the advantages and explain the distinctive characteristics of the compressed air and the hydraulics.  
10marks

17. Realize symbolically a circuit of a supply in compressed air including the following individual appliances: (1) an electric motor drive, (2) an air receiver, (3) an FRL unit, (4) a cooler, (5) a compressor, (6) a pressure switch, (7) a strainer, (8) a low pressure relief valve, (9) a pressure switch control of receiver tank pressure, (10) an automatic drain.  
10marks

18. a) A single acting reciprocating pump has a plunger of 45cm and stroke 25cm. If the speed of the pump is 32 r.p.m. Find the theoretical discharge of the pump in cm³/sec.  
6marks

   b) Where the following gears are used:
      i. Spur gears  
      ii. Spur gear and rack  
      iii. Level gears  
      iv. Worm gears  
4marks

SECTION III. CHOOSE AND ANSWER ANY ONE (1) QUESTION.

19. Complete the grid below, either naming the symbol or drawing in the named symbol: 
15marks

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Symbol 1" /></td>
<td>One – way adjustable flow control valve (flow regulator)</td>
</tr>
<tr>
<td><img src="image2.png" alt="Symbol 2" /></td>
<td>Air service unit</td>
</tr>
<tr>
<td><img src="image3.png" alt="Symbol 3" /></td>
<td>Silencer</td>
</tr>
<tr>
<td><img src="image4.png" alt="Symbol 4" /></td>
<td>Four-part valve, two positions</td>
</tr>
<tr>
<td><img src="image5.png" alt="Symbol 5" /></td>
<td>5/3 way directional control valve, mid position closed</td>
</tr>
<tr>
<td><img src="image6.png" alt="Symbol 6" /></td>
<td>Shuttle valve</td>
</tr>
</tbody>
</table>
20. Discuss the causes of:
   a. pump doesn’t deliver fluid
   b. pump making noise

21. A mechanism is defined by the figure hereafter.

   Calculate:
   (a) The speeds of each shaft I, II, III and IV
   (b) Angular velocity for motor and for each shaft.
   (c) Torques obtained on each shaft, if $T_A = 21$, $T_B = 82$, $T_C = 30$, $T_D = 90$, $T_E = 25$ and $T_F = 135$ teeth

![Mechanical Diagram]