3.19 POWER MECHANICS (447)

3.19.1 Power Mechanics Paper 1 (447/1)

SECTION A (40 marks)

Answer all the questions in this section in the spaces provided.

1. (a) Outline six key steps in the entrepreneurship process. (3 marks)
   (b) List four areas where ventilation is necessary in a power mechanics workshop. (2 marks)

2. (a) State two ethical conduct to be observed by a power mechanics technician. (1 mark)
   (b) Make a free-hand sketch of a self-tapping screw. (2 marks)

3. Outline four constructional differences between a four stroke single cylinder SI engine and a four stroke single cylinder CI engine. (4 marks)

4. (a) State two advantages of air brakes over hydraulic brakes. (2 marks)
   (b) Explain why:
      (i) the split washer has offset ends; (1 mark)
      (ii) the tab washer has a square projection on the inner edge. (1 mark)

5. (a) State two possible causes for a faint horn sound. (2 marks)
   (b) List two operational differences between the DC generator and the alternator. (2 marks)

6. (a) Explain the term “spring weight” as applied to leaf springs. (2 marks)
   (b) With respect to a single cylinder engine, differentiate between “make” and “model”. (2 marks)

7. (a) With the aid of a sketch, illustrate the type of tyre wear pattern caused by under inflation. (1 mark)
   (b) Explain the following properties of ferrous metals:
      (i) toughness; (1 mark)
      (ii) hardness. (1 mark)

8. (a) State two functions of the fuel tank cap on a single cylinder engine. (2 marks)
   (b) With the aid of diagrams, illustrate the difference between the vanes of a fluid coupling and a torque converter.
9  (a) Name **four** types of pliers. (2 marks)
    (b) List **four** thermal processes used for joining metals. (2 marks)

10 (a) Distinguish between the **two** types of engine block construction. (2 marks)
    (b) Explain the meaning of “steering geometry”. (3 marks)

**SECTION** (60 marks)

*Answer question 11 and any other three questions from this section in the spaces provided. Candidates are advised not to spend more than 25 minutes on question 11.*

11 **Figure 1** shows three orthographic views of a block drawn in first angle projection.

![Figure 1](image)

On the grid paper provided draw the block **FULL SIZE** in isometric projection taking P as the lowest point. (15 marks)

12 (a) List the accessories and equipment used in arc welding. (5 marks)
    (b) Outline the procedure for arc welding a butt joint. (10 marks)
13 **Figure 2** shows the three point type of a 2-stroke cycle petrol engine.

(a) Name the parts labelled A to F. (3 marks)

(b) Explain how the engine operates. (12 marks)

14 (a) The oil pressure warning light of a vehicle remains on when the engine is running. Outline **three** checks that may be performed on the lubrication system to establish the cause of the fault. (3 marks)

(b) With the aid of a circuit diagram, explain the operation of a two terminal flasher unit. (12 marks)

15 (a) Name **four** types of gears. (2 marks)

(b) Name **two** functions of a gear box in a vehicle. (2 marks)

(c) With the aid of a labelled sketch, explain the power flow in a three-speed sliding mesh gearbox engaged in second gear. (11 marks)
3.19.2 Power Mechanics Paper 2 (447/2)

STATION 1

In the space below, sketch in good proportion a sectional view of a sparking plug. Label four parts. (10 marks)

STATION 2

Using the tools, equipment and materials provided, fabricate the support bracket shown in figure 2. (10 marks)

Figure 2
**STATION 3**

Identify the items labelled A to E. For each item:

(a) state the material it is made of;
(b) name its use in a motor vehicle.  

(10 marks)

Complete Table 1

<table>
<thead>
<tr>
<th>ITEM</th>
<th>MATERIAL</th>
<th>USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
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</tbody>
</table>

**STATION 4**

On the piston provided, perform the following tasks:

(a) measure the side clearance of the piston ring;
(b) remove the ring from the piston;
(c) measure the free gap of the ring;
(d) measure the working gap of the ring;
(e) fit the ring back into the piston.  

(10 marks)

(Let the examiner check your work)
STATION 5

Using the tools and materials provided, connect the ignition circuit of a motor vehicle using one sparking plug.

(10 marks)

(Let the examiner check your work)

STATION 6

Identify the parts labelled K, L, M, N and O. Name the vehicle system in which each part is used. For each part, identify one defect and state its effect on vehicle performance.

Complete Table 2

<table>
<thead>
<tr>
<th>PART</th>
<th>NAME</th>
<th>VEHICLE SYSTEM</th>
<th>DEFECT</th>
<th>EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>M</td>
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<td></td>
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</tr>
<tr>
<td>N</td>
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</tr>
<tr>
<td>O</td>
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</tbody>
</table>

(10 marks)
STATION 7

On the gas welding equipment provided,

(a) Identify the parts labelled P, Q, R, S and T. \(2\frac{1}{2}\) marks

<table>
<thead>
<tr>
<th>PART</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td></td>
</tr>
</tbody>
</table>

(b) Without adjusting the regular pressure, light the equipment and set the torch to obtain an oxidising flame. \(6\frac{1}{2}\) marks

(c) Shut down the gas equipment. 1 mark

STATION 8

(a) For the single cylinder engine provided, measure and record the following:

(i) bore

(ii) stroke \(2\) marks

(b) Calculate the compression ratio of the engine if the clearance volume is taken to be 10% of the displacement volume. 8 marks
STATION 9

On the multicylinder engine provided;

(a) remove the fanbelt;
(b) identify two defects on the fanbelt and state one possible cause of each defect;
(c) state the correct remedy for each defect;
(d) re-fit the fanbelt.  

(10 marks)

STATION 10

On the battery provided, perform the following operations:

(a) measure and record the specific gravity and battery voltage of each cell in Table 3.  
   (Take cell number 1 to be next to the positive terminal)

Table 3

<table>
<thead>
<tr>
<th>Cell Number</th>
<th>Specific Gravity</th>
<th>Battery Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td></td>
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<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Check and comment on the state of:

(i) battery electrolyte level

(ii) battery charge

(10 marks)