

## 4.5 POWER MECHANICS (447)

### 4.5.1 Power Mechanics Paper 1 (447/1)

#### SECTION A (40 marks)

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

1. (a) List **two** ethical qualities expected of a workshop foreman. (1 mark)
- (b) John studied Power Mechanics at secondary school. He has been offered a job as parts' specialist in an automotive spare parts store. Outline **three** duties he will be expected to perform. (3 marks)
2. (a) State **two** safety precautions to be observed by a mechanic when lifting a heavy engine component from the floor. (2 marks)
- (b) A stud is labelled  $13.2^{+0.013}_{-0.004}$ . Determine its:
  - (i) minimum and maximum limits (1 mark)
  - (ii) tolerance (2 marks)
3. (a) State the purpose of each of the following special tools in a Power Mechanics workshop:
  - (i) tachometer (1 mark)
  - (ii) stethoscope (1 mark)
- (b) Use sketches to differentiate between an *external tab washer* and an *external star washer*. (2 marks)
4. (a) List **four** non-ferrous metals used in manufacture of motor vehicle components. (2 marks)
- (b) State **one** limitation of using photovoltaic cells in motor vehicle construction. (1 mark)
5. A four-cylinder engine has a capacity of 1408 cc and a cylinder bore of 80 mm. Calculate its:
  - (a) swept volume per cylinder (1 mark)
  - (b) stroke. (2 marks)
6. (a) List **four** types of air cleaners used in motor vehicle fuel systems. (2 marks)
- (b) Describe each of the following methods of mounting carburettors on an engine:
  - (i) updraft (1 mark)

- (ii) side draft (1 mark)
7. (a) Outline **four** procedures that should be undertaken before dismantling a multi-cylinder engine on a work bench. (4 marks)
- (b) List **two** types of wheel rims used in light vehicles. (1 mark)
8. (a) State **two** constructional differences between *front-wheel transmission drive* and *rear-wheel transmission drive*. (2 marks)
- (b) Name **two** factors that determine the capacity of a conventional motor vehicle battery. (2 marks)
9. (a) Outline **three** procedures which should be carried out before lighting oxy-acetylene welding equipment. (2 marks)
- (b) Identify **two** causes of a spongy brake pedal. (2 marks)
10. (a) State **two** functions of engine mountings. (2 marks)
- (b) List **two** essential features of effective steering gearboxes. (2 marks)



## SECTION B (60 marks)

Answer question 11 on the A3 paper and any other three questions from this section in the spaces provided.

Candidates are advised to spend not more than 25 minutes on question 11.

11. Figure 1 shows a machined bracket. Draw, full size, in first angle orthographic projection the following views:

- Front elevation in the direction F.E.
- End elevation in the direction E.E.
- Plan

(15 marks)

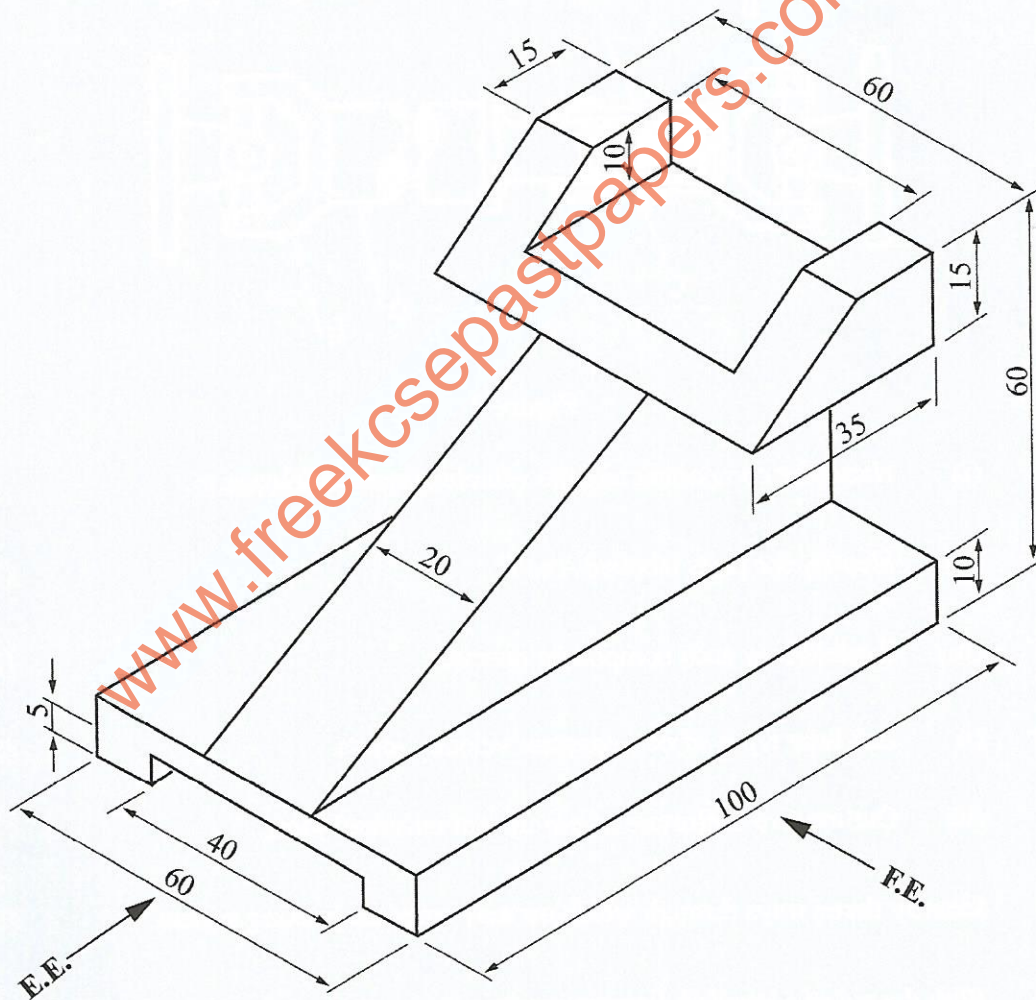
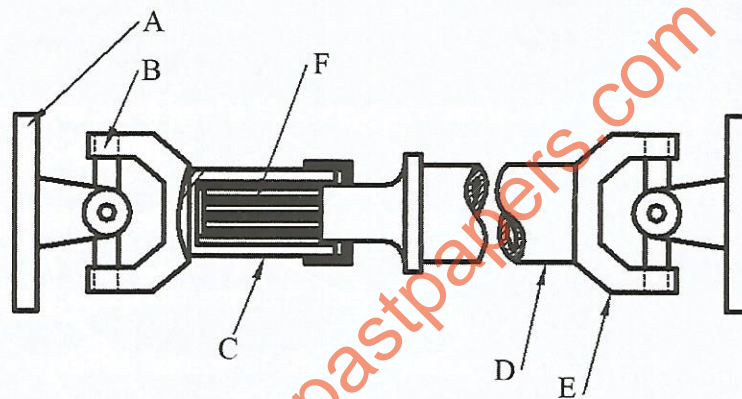


Figure 1

12. (a) (i) State **one** function of an engine block. (1 mark)
- (ii) Describe the integral type of engine block construction. (2 marks)
- (iii) Distinguish between 'wet' and 'dry' liners or sleeves used in aluminium engine blocks. (2 marks)
- (b) Explain **five** operational differences between a *two-stroke cycle* and a *four-stroke cycle* petrol engine. (10 marks)

13. (a) **Figure 2** shows a motor vehicle component.



**Figure 2**

- (i) Name the component and the vehicle system it belongs to. (1 mark)
- (ii) Identify the parts labelled A to F. (3 marks)
- (iii) Explain how each component operates. (7 marks)
- (b) (i) List **four** types of non-constant velocity joints. (2 marks)
- (ii) Outline **two** indicators of a worn-out universal joint. (2 marks)
14. (a) Identify **three** ways through which air may enter the braking system. (3 marks)
- (b) With the aid of a labelled diagram, explain the operation of a cam-operated drum brake system. (12 marks)



15. (a) (i) Sketch a poppet valve and label **four** parts. (4 marks)
- (ii) Identify **three** common defects associated with poppet valves. (3 marks)
- (b) Explain how the rocker arms of an overhead valve train are lubricated. (4 marks)
- (c) State **two** factors considered when selecting tyre tread patterns for each of the following road conditions:
- (i) normal touring (2 marks)
- (ii) high speed operation (2 marks)

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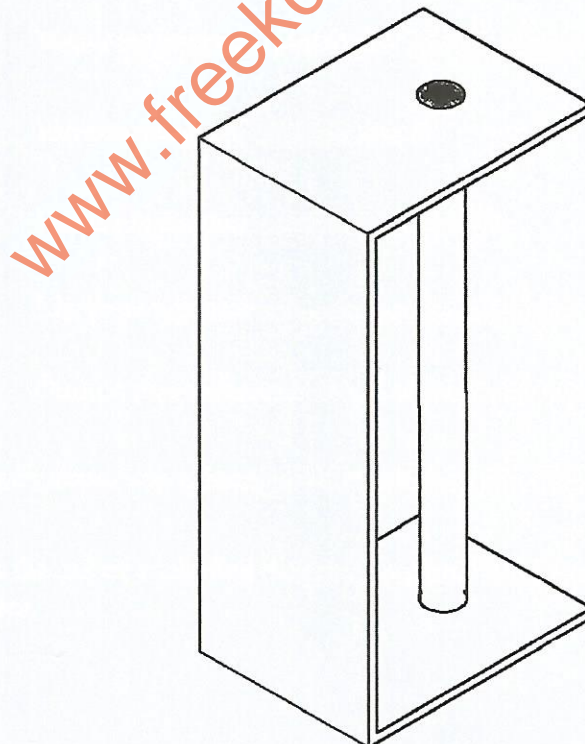
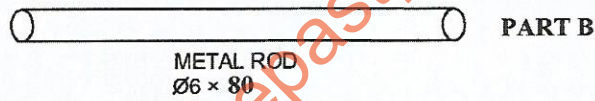
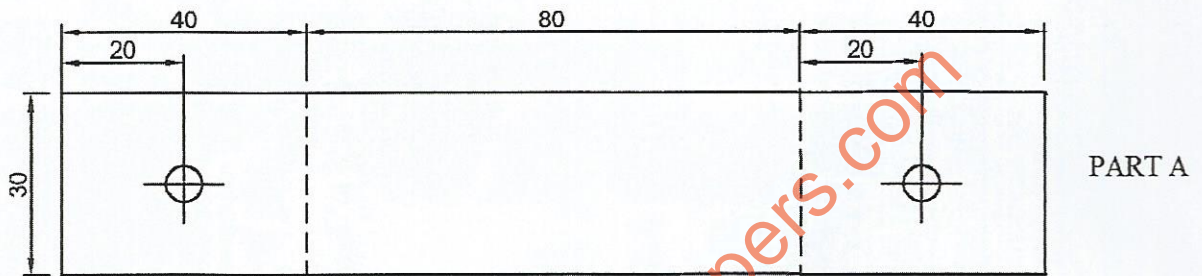
### 4.5.2 Power Mechanics Paper 2 (447/2)

#### STATION 1

In the space provided below, sketch in good proportion a **sectional longitudinal view** of a *sparking plug* and label **four** main parts. (10 marks)

#### STATION 2

Using the tools and materials provided, make the bracket shown in the **figure** below. (10 marks)





**STATION 3**

Identify the vehicle parts labelled A, B, C, D and E and state the vehicle system in which each is used. Name the material each part is made of and state the use of each part in the vehicle. Complete the table. (10 marks)

Label	Name	Vehicle System	Material	Cause
A				
B				
C				
D				
E				

**STATION 4**

On the single cylinder engine provided:

- (a) perform the pre-start up checks
- (b) start the engine and adjust to attain the smoothest idling speed (10 marks)

**LET THE EXAMINER CHECK YOUR WORK.**

**STATION 5**

Using the tools and materials provided, connect a twin headlight parallel circuit controlled by a single switch. (10 marks)

**LET THE EXAMINER CHECK YOUR WORK**

## STATION 6

Identify the engine parts labelled **F, G, H, J** and **K**. In each case, identify **one** defect and state **one** possible cause and **one** possible effect of the identified defect. Complete the table. (10 marks)

Label	Name	Defect	Cause	Effect
F				
G				
H				
J				
K				

## STATION 7

On the brake drum of the motor vehicle provided, perform each of the following tasks:

- remove the return spring
- measure the tension of the spring
- replace the return spring

(10 marks)

**LET THE EXAMINER CHECK YOUR WORK**

## STATION 8

Identify each of the following tools and substances labelled **Q** to **Z** and in each case, state **one** use in a motor vehicle. Complete the table.

Label	Name	Use
Q		
R		
S		
T		
U		
V		
W		
X		
Y		
Z		



**STATION 9**

Using the oxy-acetylene equipment provided, braze the hole identified by the examiner on the vehicle part provided. (10 marks)

**LET THE EXAMINER CHECK YOUR WORK.**

**STATION 10**

On the multi-cylinder engine provided, demonstrate to the examiner how to identify a misfiring plug. (10 marks)

**LET THE EXAMINER CHECK YOUR WORK.**

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