4.5 POWER MECHANICS (447)

4.5.1 Power Mechanics Paper 1 (447/1)

SECTION A (40 marks)

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

1. (a) State the purpose of yellow lines in a power mechanics workshop. (1 mark)

(b) State **three** factors which should be considered when locating an automotive spare parts store. (3 marks)

2. (a) State **two** safety precautions which should be observed when working with grease and oils. (2 marks)

(b) Sketch each of the following types of screw threads:

(i) square (1 mark)

(ii) acme (1 mark)

3. (a) State the purpose of each of the following tools in a motor vehicle garage:

(i) puller (1 mark)

(ii) telescopic gauge (1 mark)

(b) Explain the operational difference between an external circlip and an internal circlip. (2 marks)

4. (a) Describe the energy conversion cycle in a conventional internal combustion engine. (2 marks)

(b) Describe the volumetric efficiency of an engine. (2 marks)

5. (a) Explain **one** negative effect of high compression ratio in an engine. (2 marks)

(b) State **two** properties of copper that makes it attractive for use in auto-electrics. (2 marks)

6. (a) State **two** functions of seals in an engine. (2 marks)

(b) Outline **two** reasons for carrying out ignition timing. (2 marks)

7. (a) State the effect of:

(i) too small contact breaker points gap (1 mark)

(ii) too big contact breaker points gap (1 mark)

(b) State **two** methods used by motor vehicle designers to reduce crankshaft whip. (2 marks)

8. (a) Outline **two** causes of excessive *sulphation* of a vehicle battery. (2 marks)

(b) State **three** advantages of brazing over fusion welding. (3 marks)

9. (a) Explain the following terms as used in braking systems:

(i) brake fade (1 mark)

(ii) primary shoe (1 mark)

(b) State the purpose of the safety ridge near the lips of a tyre rim. (1 mark)

10. (a) Name **four** types of springs used in vehicle suspension systems. (2 marks)

(b) Outline **two** reasons for having caster angle in steering geometry. (2 marks)

SECTION B (60 marks)

*Answer **question 11** on A3 paper provided 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 machine block drawn in isometric projection.

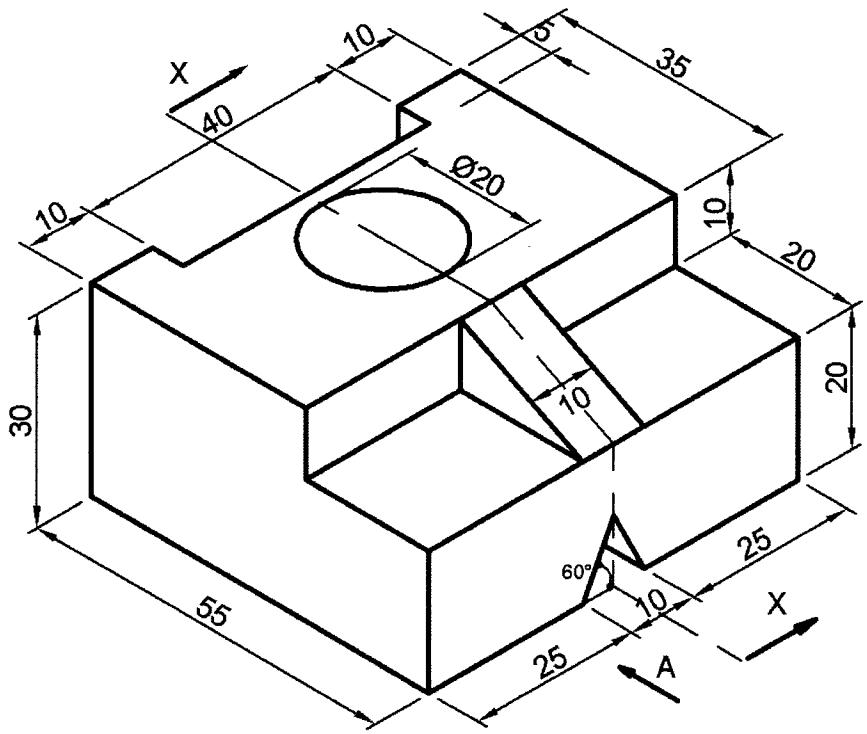

Figure 1

Using a scale of 2:1, draw in first angle projection the following views:

(a) Front elevation in the direction of arrow **A**;

(b) A sectioned end elevation along the cutting plane **x – x.**

NB: The ∅ 20 mm is a through hole and the 10 mm V-trough also goes through the block.

(15 marks)

12. (a) **Figure 2** shows a component of a vehicle system.

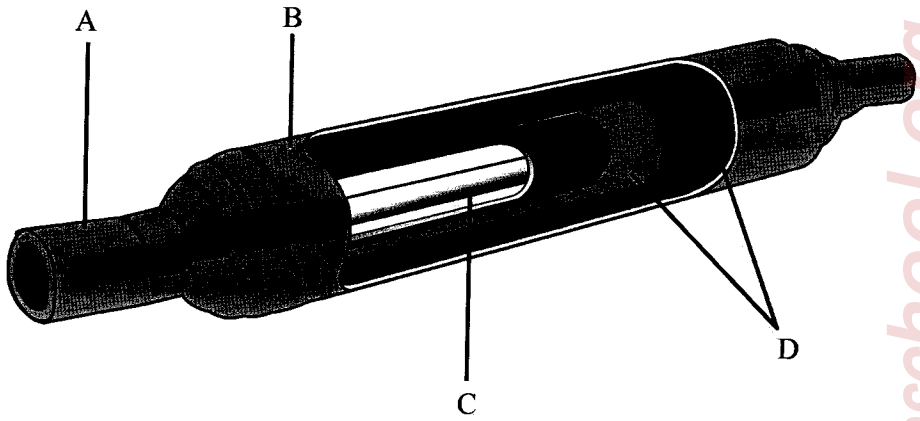

Figure 2

(i) State the name and type of the component. (1 mark)

(ii) Name the parts labelled A, B, C and D. (2 marks)

A .....

B .....

C .....

D .....

(iii) Explain how the component works. (3 marks)

(b) Interpret the meaning of each of the following types of smoky exhausts and in each case, state **two** possible causes. Complete the table. (9 marks)

Type of smoke	**Meaning**	**Possible causes**
Blue		i) ii)
Black		i) ii)
White		i) ii)

13. (a) State **three** reasons why petrol should have high volatility. (3 marks)

(b) Using sketches, illustrate the four-cylinder engines with the following types of cylinder arrangements:

(i) V-arrangement (2 marks)

(ii) horizontally-opposed arrangement (2 marks)

(c) With the aid of a diagram, explain the operation of the carburettor float circuit of a single cylinder engine. (8 marks)

14. (a) List **two** functions of the crown and pinion assembly of the differential unit. (2 marks)

(b) (i) Sketch a fluid coupling assembly and label six parts. (7 marks)

(ii) Explain the operation of the coupling when the engine is:

(a) idling (2 marks)

(b) running at low to medium speed (2 marks)

(c) running at medium to high speed (2 marks)

15. (a) State the purpose of each of the following valves in a braking system:

(i) metering valve (1 mark)

(ii) proportionating valve (1 mark)

(b) Outline the procedure of bleeding air out of a braking system. (7 marks)

(c) State **two** possible causes of each of the following faults in motor vehicle electrical circuits:

(i) Head lights dim when engine is idling (2 marks)

(ii) Wiper fails to operate (2 marks)

(iii) Horn sound is faint (2 marks)