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) Define a "machine". (1 mark)

(b) State **two** reasons for having a first aid box in a vehicle. (2 marks)

2 (a) State **three** functional characteristics of a road wheel. (3 marks)

(b) (i) Define a business plan. (1 mark)

(ii) List **four** components of a business plan. (2 marks)

3 (a) A piston ring fitted in a cylinder has a gap clearance of 0.25 mm at room temperature. Explain what happens to the gap clearance when the ring is hotter than the cylinder. (2 marks)

(b) Name the parts labelled A, B, C and D on the fastener in **figure 1**. (2 marks)

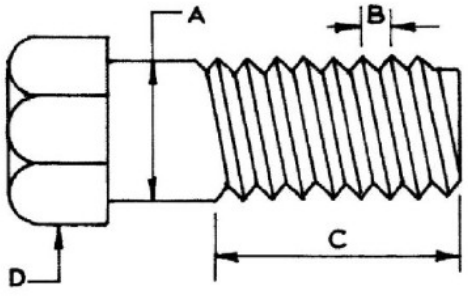

Fig. 1

A .....

B .....

C .....

D .....

4 (a) State the purpose of each of the following tools:

(i) reamer; (1 mark)

(ii) tap. (1 mark)

(b) State **two** factors to consider when selecting a spanner for a motor vehicle repair task. (2 marks)

5 (a) State **four** applications of a photovoltaic cell. (2 marks)

(b) List **four** types of lighting circuits of a motor vehicle. (2 marks)

6 (a) State **two** functions of the final drive. (2 marks)

(b) Sketch the symbols used to represent the following in assembly drawings: (2 marks)

(i) a square;

(ii) a countersunk.

7 Outline **three** properties of soldering flux. (3 marks)

8 (a) List **four** types of manual steering gearboxes. (2 marks)

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

9 State **four** purposes of lubricating oil additives. (4 marks)

10 Outline **eight** components of a pressurized water cooling system of a motor vehicle. (4 marks)

SECTION B (60 marks)

*Answer **question 11** on A_3 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 2** shows a machine block drawn in isometric projection.

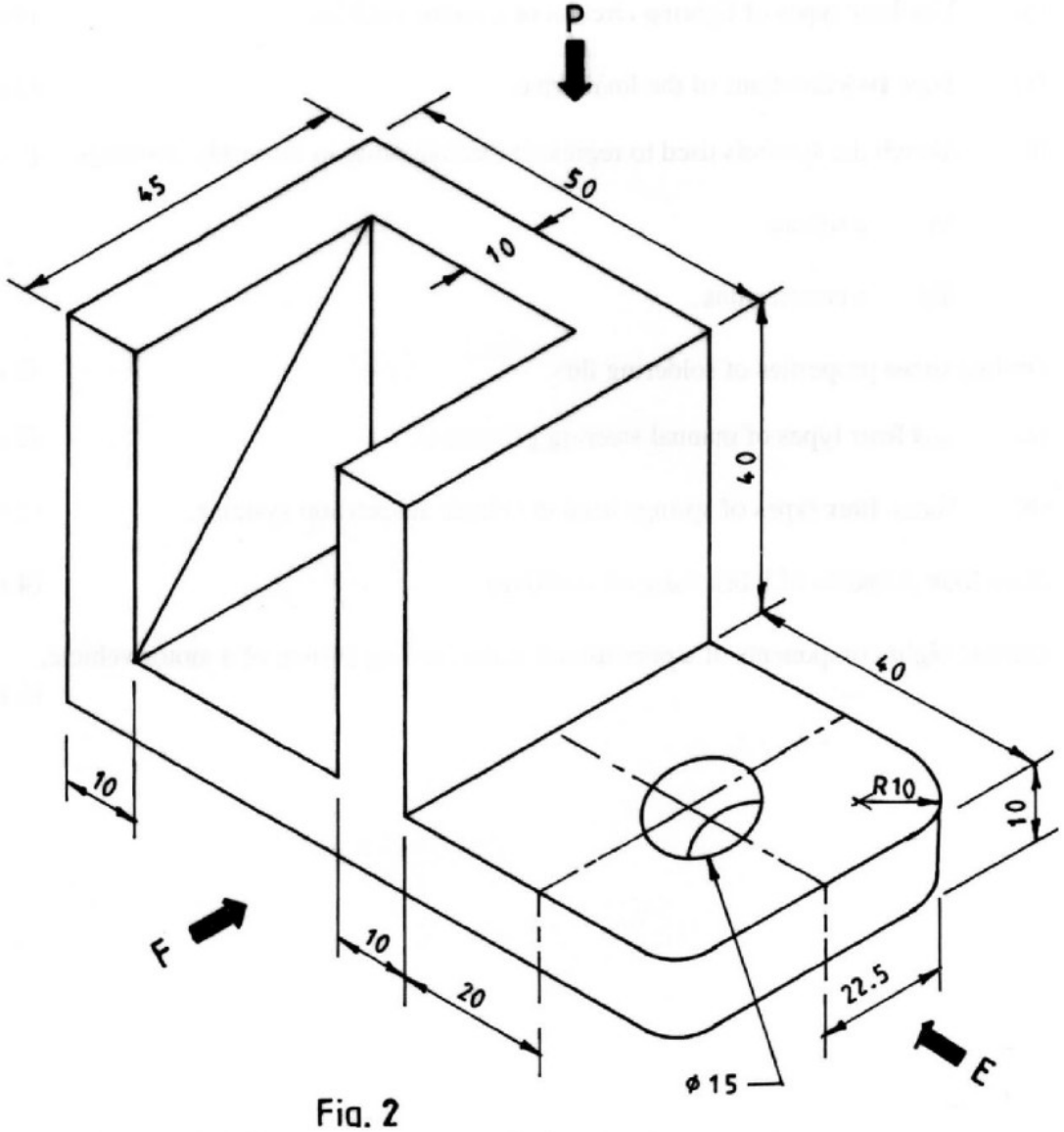

Fig. 2

Draw **full size** in 3rd angle projection the following views:

(a) front elevation in direction "F";
(b) end elevation in direction "E";
(c) plan.

(15 marks)

12 The **figure 3** shows a disc brake assembly:

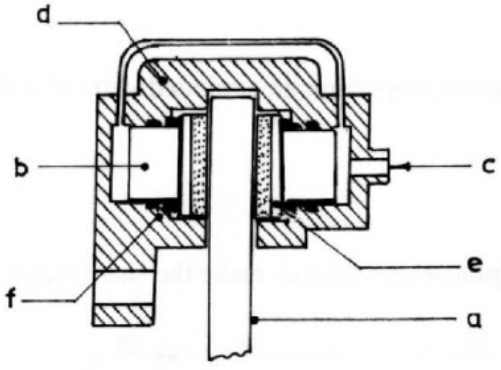

Fig. 3-disc brake assembly

(a) Name the parts labelled a, b, c, d, e and f. (3 marks)

(b) Explain the operation of the system when:

(i) brakes are applied; (5 marks)
(ii) brakes are off. (7 marks)

13 (a) State **three** functions of the exhaust system. (3 marks)

(b) (i) State the cause of back pressure in an exhaust system. (1 mark)

(ii) Explain the consequence of excessive back pressure. (2 marks)

(c) With the aid of a labelled cross-sectional sketch, describe the construction of an absorption silencer. (9 marks)

14 (a) State **three** operational differences between petrol and diesel engines. (3 marks)

(b) Compare a petrol and a diesel engine of the same size with reference to: (12 marks)

(i) weight;
(ii) running costs;
(iii) emissions;
(iv) thermal efficiency;
(v) compression ratio;
(vi) operating temperatures.

15 (a) State **four** functions of oil in an engine. (4 marks)

(b) Describe the following lubrication methods used in different engines: (11 marks)

(i) splash feed;

(ii) pressure feed.

3.19.2 Power Mechanics Paper 2 (447/2)

STATION 1

In the space provided, sketch in good proportion an exploded view of a differential assembly.
Label **four** parts. (10 marks)

STATION 2

Use the materials, tools and equipment provided to make the sheet metal object shown in **figure 1**.

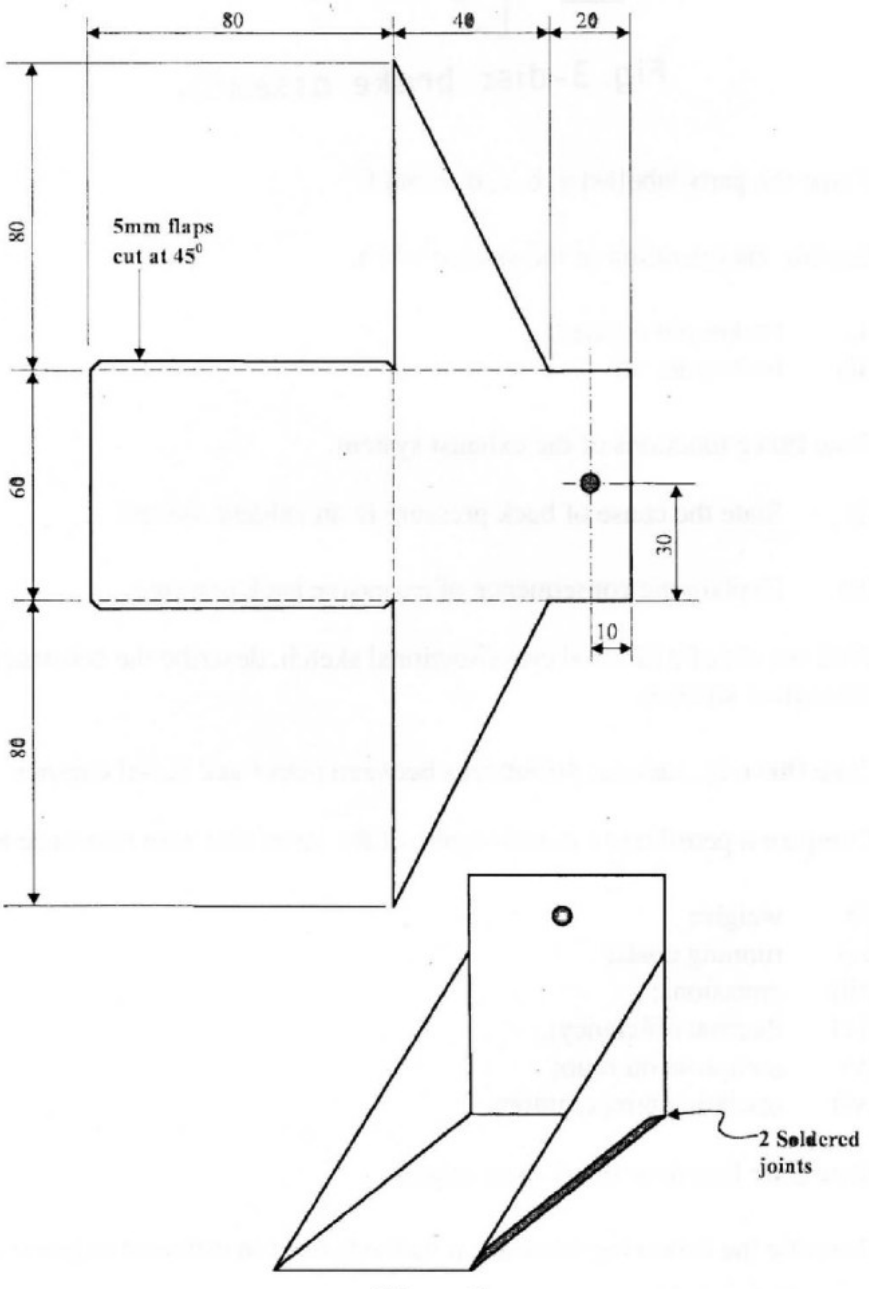

Figure 1

STATION 3

Identify the parts and components labelled **P** to **T** and in each case, state the vehicle system it belongs to and its purpose. Complete the table below. (10 marks)

PART	NAME	VEHICLE SYSTEM	PURPOSE
P			
Q			
R			
S			
T			

STATION 4

Using the instruments, materials and battery provided:

(a) Measure and record in the table below the cell voltage and the specific gravity for each of the cells.

LET THE EXAMINER CHECK YOUR WORK.

CELL NUMBER	VOLTAGE	SPECIFIC GRAVITY	STATE OF CHARGE
1			
2			
3			
4			
5			
6			

(b) Using the reading obtained in (a) above, comment on the state of the battery charge in each case. (10 marks)

STATION 5

Identify the parts labelled **A**, **B**, **C**, **D**, **E** and name the vehicle system in which each is used. For each part, identify **ONE** defect and state its effect on vehicle performance. Complete the table below. (10 marks)

PART	NAME	VEHICLE SYSTEM	DEFECT	EFFECT
A				
B				
C				
D				
E				

STATION 6

Using the components and materials provided, connect a **FOUR** lamp lighting circuit which satisfies the following conditions:

(i) lamp 1 and 2 are in series;

(ii) lamp 3 and 4 are in parallel;

(iii) the lamps are controlled by switch S such that when lamps 1 and 2 are ON, lamps 3 and 4 are OFF. (10 marks)

LET THE EXAMINER CHECK YOUR WORK.

STATION 7

On the vehicle provided:

(a) Measure the free brake movement. (8 marks)

(b) Comment on the state of the brakes. (2 marks)

LET THE EXAMINER CHECK YOUR WORK.

STATION 8

On the engine provided:

(a) Show the examiner **FOUR** visible components of the lubrication system. (4 marks)

(b) (i) Check the oil level;

(ii) Comment on the state of the oil level and the oil to the examiner. (6 marks)

LET THE EXAMINER CHECK YOUR WORK.

STATION 9

On the single cylinder engine provided, determine the compression ratio. (10 marks)

LET THE EXAMINER CHECK YOUR WORK.

STATION 10

On the multi-cylinder engine provided, carry out the following tasks:

(a) Remove the contact breaker points;

(b) Tell the examiner about the condition of the contact breaker points;

(c) Replace the contact breaker points and set the gap to 0.4 mm. (10 marks)

LET THE EXAMINER CHECK YOUR WORK.