

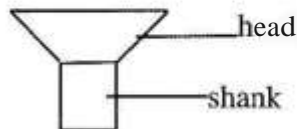
**24.0 POWER MECHANICS (447)**

**24.1 Power Mechanics Paper 1 (447/1)**

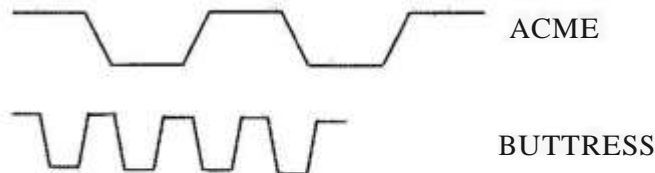
1. (a) Workshop areas  
Charging area  
Spraying/painting  
Soldering/Welding  
Storage for volatile materials Any 2x ½

- (b) Trade courses at DIT  
General mechanics  
Panel beating  
Auto-electrics  
Spraying  
Uphostery and interior decoration Any 2x %

2. (a) Countersink: Rivet



- (b) Screw Thread



Sketch 1  
Labelling 2 x 1  
**(2x1)**

3. (a) Greases  
(i) Soap base  
(ii) Number base (2 x ½ marks)

- (b) Volatile: Substances which readily turn to vapour at a relatively low temperature. (1 x 1)  
e.g. petrol, cellulose, thinners, paint, spirits. Any 2 x ½

4. (a) Terminology  
(i) Bore: Is the diameter of an engine cylinder.  
(ii) Throw: Is the distance between centreline of the crankshaft and the centreline of a crankpin.  
(iii) V. E: Is the amount of air drawn in a cylinder divided by the actual volume of the cylinder. (3 x 1 marks)

- (b) Charging System  
 (i) Restores back into the battery the current used to start an engine.  
 (ii) Handles the load of lights, ignition, radio and other circuits when engine is running. (2 x 1)

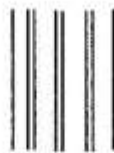
5. (a) Checks on Connecting Rod  
 Rod side clearance  
 Rod alignment for out of round  
 Bushings for wear and scoring  
 (b) Measurements  
 A: Ring gap, piston ring, feeler gauge  
 B: Side clearance, piston ring, feeler gauge (1½ x 2)

6. (a) Electrical component  
 DIODE converts AC produced by alternator to DC  
 RELAY is a magnetic switch used in various electrical circuits. 2x1
- (b) Engine Backfiring  
 Wrong ignition timing                      Carbon deposits  
 Wrong S.P. range                              Overheating  
 Too lean mixture                                Faulting condenser  
 Too rich mixture

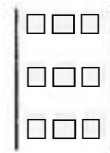
7. (a) Types of Thread Patterns Any 4 x ½



ZigZag



Straight



Square

- (b) Absorbing shocks Any 2 x 1  
 Car tires  
 Shock absorbers  
 Spring in vehicle seats  
 Suspension springs (4 x ½)

8. (a) Meaning  
 Bleeding is the process of removing trapped air in braking system  
 Flushing is the process of removing old/used fluid from the system. (2 x 1)
- (b) Steering system  
 A Track rod  
 B Steering gear box  
 C Steering arm  
 D Idler arm 4x4½

9. (a) Rear Axles  
Semi-floating  
Three quarter floating  
Full floating
- (b) Live axle transmits  
While dead axle doesn't transmit

Any 2 x 1/2

10. (a) Tool sizes  
Spanner is the distance between the two jaws  
Hammer is the weight of the head

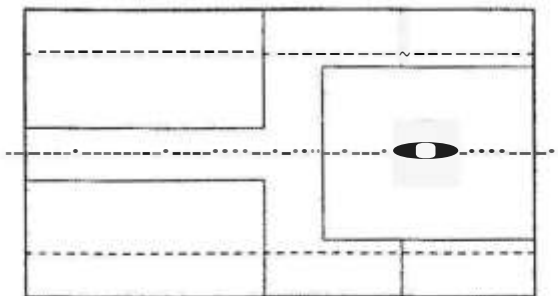
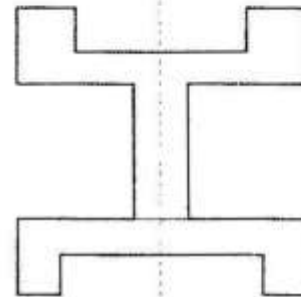
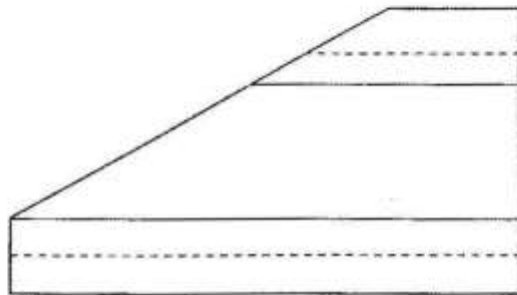
(2x1)

- (b) Straight snips



(3 marks)

11.



12. (a) Petrol  
Diesel  
Gasohol  
Liquidified petroleum gas

(4x%= 2)

- (b) (i) Fuel tank - U  
Course filter • V  
Lift pump - W  
Fine filter (s) • X  
Injector pump - Y  
Injectors - Z

(6 x 1/2 = 3)

- (ii) Operation

As the engine crankshaft rotate, a low pressure (depression) is created in the chamber of the lift pump. This creates a pressure difference between the pump chamber and the tank, thereby causing fuel to be drawn into the lift via the course filter. The course filter removes large dirt particles from the fuel.

As the cranesraft continues to rotate, the lift pump then applies a higher pressure to the fuel and forces it through the fine filters to the galleries of the injector pump. The fine filters remove any remaining fine particles from the fuel because diesel requires to be extremely clean.

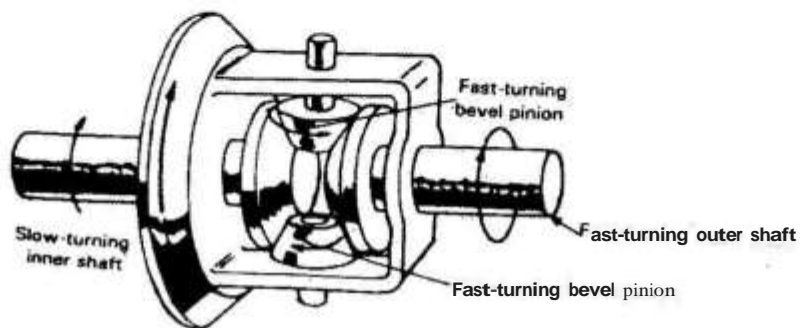
The injector pump accurately meters the right amount of fuel to each injector nozzle and also pumps it at very high pressure at the end of each compression stroke, and in accordance with the firing order.

Each injector atomises the fuel and sprays it to the compressed air in each cylinder, thereby causing combustion to take place.

Due to the very pressures in the system, some fuel always escapes back past the injector nozzles. This is collected by the leak-off pipes and is returned either to the tank to the intake side of the fine filter.

(10 marks)

13. (a) (i) Universal Joint compensates for change in drive shaft angle.  
 (ii) Slip joint compensates for change in drive shaft length. (2×1 marks)
- (b) Operation of Differential unit when cornering.



; Taking a corner

Sketching = 4  
 Labelling = 3

### Cornering

When taking corners, the resistance on the rotation of the inner axle bevel gear increases as the wheels turn at different speeds. This causes the differential pinion gears to turn on their own axis and roll

around the axle bevel gears. When this happens the inner wheel axle gear slows down. This causes the pinion gear to 'walk' around the slower turning axle bevel gear.

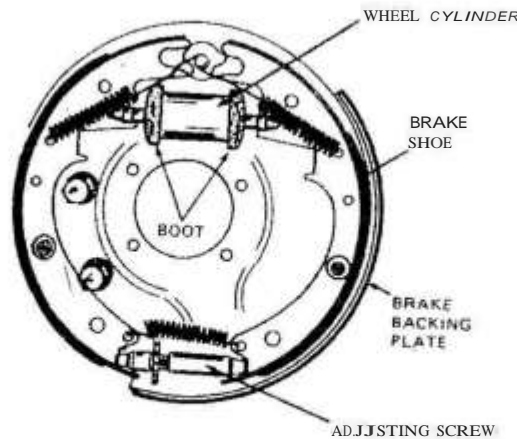
This results in additional rotary motion being transmitted to the outer axle bevel gear causing the axle shaft to turn faster but still providing equal power to both wheels.

In some cases one of the driving wheels can have little or no traction, the torque required to turn the wheel without traction being very low. The wheel with good traction is in effect holding the axle bevel gear on that side stationary. Consequently, the differential pinion gears 'walk' around the stationary side axle bevel gear and drive the other wheel at twice the speed. This, the wheel with no traction will be essentially slipping. A wheel with no traction cannot deliver torque, hence, all the turning effort goes to the slipping wheel. To counter wheel slippage, non-slip differential or differential locks are used. (6 x 1 marks)

14. (a) Advantages of disc brakes  
 Greater heat dissipation  
 Cleaner braking surfaces  
 Lighter in weight  
 Simpler construction hence easier to service

Any 3 x 1

- (b) Construction of drum brake assembly



Sketching and labelling  
 (4 marks)

The assembly comprises the following:

- (i) Brake Drum made of iron and bolted to the wheel to rotate together. (2 marks)
- (ii) Backing plate made of steel and covers the shoe assembly. (2 marks)
- (iii) Shoe assembly comprising two shoes, wheel cylinder, springs, adjusting screws and anchor plate. (2 marks)
- (iv) Wheel cylinder fitted between the ends of the shoes to activate them when brakes are applied. (2 marks)

- (v) Springs, linkages and fasteners.

Total marks for explanation = 8

15. (a) Frame Sections



Channel



Box



Tubular

3 x 1

(b) Types of Car Bodies

- (i) Saloon (sedan) has closed body with four doors.
- (ii) Station wagon (estate) has extended roof to the rear and folding rear seat to create space for luggage.
- (iii) Coupe (sport) has closed body with two doors and lowered roof towards the back.
- (iv) Convertible (drop head) closed car that can be opened by removing or lowering the roof.

Naming 4 x ½  
Description 4 x 1

(c) Checking minor misalignment

(i) Wheel base check

- Set front wheels in the straight position
- Check wheel base on each side

(2 marks)

(ii) Alignment

- Check to ensure rear wheels are parallel to each other
- Hold straight edge against the rear wheel
- Turn the front wheel until parallel to straight edge
- Do the same for both sides

(iii) Plumblines check

- Drop plumblines from both sides of each shackle of the spring and mark on the floor with chalk for all the 8 points.
- Join the chalk marks diagonally
- If frame is aligned, all the diagonals should cross at the centre line.

Naming 3 x 1  
Description 3 x 1