30.19 POWER MECHANICS (447)

30.19.1 Power Mechanics Paper 1 (447/1)

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1. (a) **FIRE EXTINGUISHERS**
Carbon dioxide
Dry powder
Sand or soil — Any 2 x ½

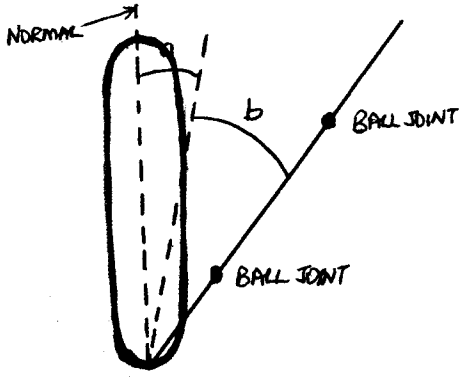
(b) **LIQUID PRESSURE**
It increases with depth
Act equally in all direction
Finds its own level — Any 2 x ½

2. (a) **USE OF TORQUE WRENCH**
Cylinder head bolts
Crankcase studs or bolts
Main and big end nuts
Flywheel bolts — Any 3 x ½

(b) **CAST IRON FOR ENGINE BLOCKS**
Has low melting point
Easy to machine
Cheaper compared to other types of iron — Any 2 x 1

3. (a) **ADVANTAGE OF INTEGRAL BODY**
Light in weight
Strong and compact
Cheap for mass production
Less noisy I vibrations — Any 2 x 1

(b) Camber a kingpin inclination



a CAMBER ANGLE
b KPI

4 x ½

4. (a) TYPES OF SPRINGS
Coil
Torsinal bar
Rubber
Laminated elliptical — 4 x ½

(b) **COUNTERSINKING & COUNTER BORING**

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5. (a) **VISCOSITY**

(i) Measure of the rate of flow of an oil.

(ii) Gearbox and differential. 2 x 1

(b) Wet oily deposits: Oil leakage at piston rings, valve guides or fuel pump.
Sooty black deposit: Over choking, clogged air filter, excessive idling.
2 x 1

6. (a) Inlet value clearance too small – opens too early and closes too soon hence reduce volumetric efficiency.
Exhaust valve clearance too big - value open too late hence high fuel consumption low volumetric efficiency 2 x 1½

(b) Compression ratio

$$CR = \frac{DV - CV}{CV}$$

Where $DV = Tir^2 \times stroke$

$$= \frac{22}{7} \times 5010^2 \times \frac{100}{20}$$

$$= 785.7cc$$

$$CR = \frac{785.7}{100100} = 8.9:1$$

6 x ½

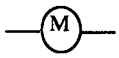
7. (a) **FUNCTION**

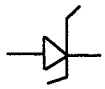
Sychronizer	-	matches the speed of countershaft
Idler gear	-	facilitates change of motion to reverse
Fork	-	selects preferred gear

3 x 1

(b) **SYMBOLS**

(i) 

(ii) 

(iii) 

(iv) 

4 x ½

8. (a) **MEASUREMENTS**

(i)	SPRING	-	Height and squareness
(ii)	CAMSHAFT	-	Lobe height, journal ⌀

4 x ½

(b) DISADVANTAGES – Residue attracts oxidation leading to weakened joint.
SOFT SOLDER - Tin (60%) and Lead (40%) 2 x 1

9. **ENGINE TERMS**

(a)	Valve lead	-	Where exhaust valve opens before BDC as exhaust stroke to allow exhaust gases to exit.
(b)	Valve lag	-	Inlet valve closes after BDC on oilet stroke to allow a admission of more flesh mixture.
(c)	Valve overlap	-	When both exhaust and intake valves are open at the end of exhaust stroke and beginning of intake stroke.

(1½ x 3)

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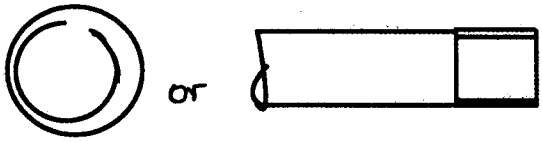
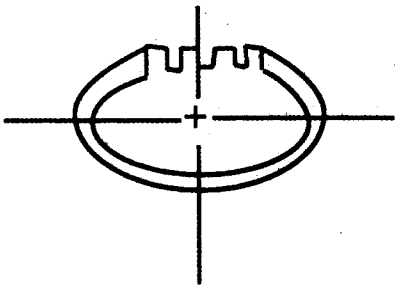
10. **SYMBOLS**

(a)



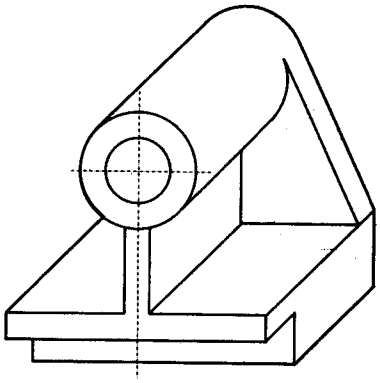
(b)



(c)

3 x 1

11.



10 faces x 1	*= 10*
Oblique	*= 1*
Face X X at front	*= 1*
Dimensioning 3 x ½	*= 1½*
Proportionality	*= 1*
Neat ness	*= ½*
TOTAL	*= 15 marks*

12. (a) **SERVICE CHECKS**

Burnt faces
Face wastage
Face pitting
Stem bending
Scoring

Any 4 x ½

(b) **TESTING RADIATOR FOR LEAKS**

Mount radiator in upright position.
Close the lower end
Fill it with water and pressure
Identify and mark leakage points. 4 x1

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(c) **DETECTING AND CORRECTING MISFIRING S. PLUG**

- Start the engine and leave it running at idle speed. 1
- Remove spark plug lead for cylinder number one spark plug and listen to the idling.
- The idling would slow down and get noticeably rougher if that cylinder is firing. 1
- Repeat the above procedure for each of the three spark plugs. 1
  The plug that does not five any noticeable change is misfiring. 1
- Stop the engine and remove this plug. 1
- Replace the plug with a good one. 1
- With the engine at idle speed again, remove the plug cable for this new plug and see if there will be a difference in idling. If it is there, then it was the plug that was the cause.
- If the misfiring persists, replace the plug cable with a good one and try to notice the difference. 1

9 x 1

13. (a) **ADVANTAGES OF PHEUMATIC BRAKES**

- Maintenance is cheaper
- Compressed air can be used for other application
- Air is readily available at no cost
- Equipment is cheap to produce.

Any 3 x 1

(b)

A Push rod
B Reserviour
C Piston
D Valve
E Spring
F Seal

6 x ½

(c) **OPERATION**

ENGAGEMENT

- When the push rod moves into the cylinder it compresses the fluid. 1
- Further movement closes the port to reserviour thus trapping the fluid into the cylinder.
- Continued movement of the piston increases the fluid pressure. 1
- Increased pressure acts equally in the system and pushes pistons in the wheel cylinder outward to engage the brake shoes. 1
- Further pressure on pedal sustains pressure in the system. 1

DISENGAGEMENT

- When it is released, the spring action and back pressure of fluid releases the pressure on the wheel cylinder to release the brakes. 1
- Pressure is balanced through the reserviour by pass. 1

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(9 marks)

14. (a) **EFFECTIVE STEERING SYSTEM**

Being self- centering
Should enable accurate control along the path taken by the vehicle at all times.
Shouldn't be affected by the action of suspension and braking systems.

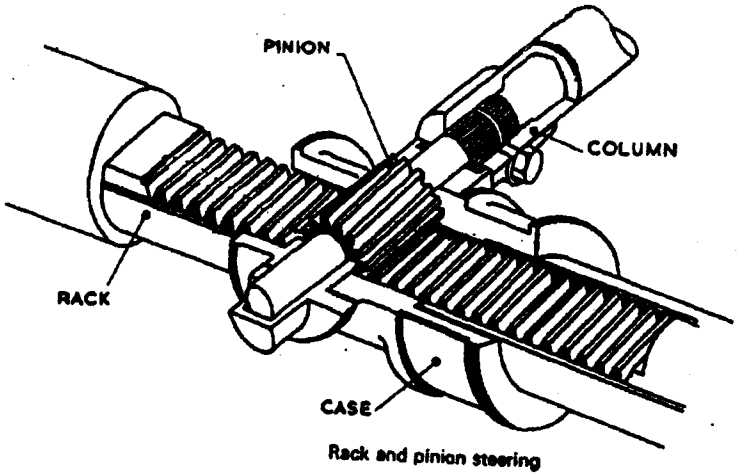
Any 3 x 1

(b) **PRELIMINARY CHECKS**

- Kingpins and bushes for excessive wear and lift.
- Ball joints for locking, excessive war and rod lifting.
- Hub bearing for free play and correct adjustment.
- Swivel points of suspension for free movement.
- Steering gear box for excessive wear and being secured.
- Shackles pins and bushes for excessive war and side movement.

Any 4 x 1

(c)



Rack and pinion steering

SKETCH 2 x 1
LABELLING 4 x ½

The rack consists of a cylindrical steel bar which has gear teeth machined on one side.
The steel pinion, which is attached to the lower end of the steering column, is meshed with the teeth of the rack. When the steering wheel is rotated, it causes the rack to move to and fro along its axis.
The ends of the rack are connected to the steering track arms by the short balt jointed tie rod ends. Therefore, its movement causes the wheels to turn through this mechanism.

15. (a) **OPERATIONAL REQUIREMENT FOR PROPELLER SHAFT**

High resistance to misalignment
Torsional stress of hollow shaft
Shouldn't exceed prescribed maximum length
Low resistance to any change in rotational speed.

(b) **REMOVING SERVICING AND INSTALLING PROPELLER SHAFT (PS)**

(i) Carryout visual inspection to identify the problem;
(ii) Place vehicle on stands to access underneath;
(iii) Remove PS with universal joints from vehicle;
(iv) Mark matching flange for accurate reinstallation;

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(v) Remove universal joint from the propeller;
(vi) Check the propeller shaft for defects e.g dents and cracks;
(vii) Disassemble the universal joints;
(viii) Inspect the bearing cups and rollers for wear;
(ix) Replace worn out parts;
(x) Assemble the universal joint;
(xi) Reassemble the unity to the vehicle aligning the flange and pinion shaft;
(xii) Test for free movement in all directions;
(xiii) Remove vehicle from stands.

(10 x 1 and 4 x ½)

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