
POWER MECHANICS PAPER 1

ANSWERS

KCSE 2010

Coordinated by KENPRO, Macjo Arcade, 4th Floor, Suite 15E, Off Magadi Road, Ongata Rongai
|Tel: +254202319748 | E-mail: infosnkenya@gmail.com | Website: www.schoolsnetkenya.com/

Power Mechanics Paper 1

1. (a) **FIRE EXTINGUISHERS**

Carbon dioxide

Dry powder

Sand or soil

(b) **LIQUID PRESSURE**

It increases with depth

Act equally in all direction

Finds its own level

Any 2 x $\frac{1}{2}$

Any 2 x $\frac{1}{2}$

2. (a) **USE OF TORQUE WRENCH**

Cylinder head bolts

Crankcase studs or bolts

Main and big end nuts

Flywheel bolts

Any 3 x $\frac{1}{2}$

(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

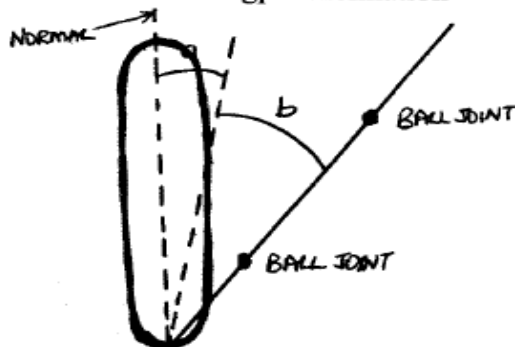
Strong and compact

Cheap for mass production

Less noisy I vibrations

Any 2 x 1

(b) Camber a kingpin inclination



a CAMBER ANGLE

b KPI

4 x $\frac{1}{2}$

4. (a) **TYPES OF SPRINGS**

Coil

Torsional bar

Rubber

Laminated elliptical

4 x $\frac{1}{2}$

(b) **COUNTERSINKING & COUNTER BORING**


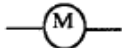
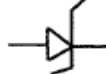



5. (a) **VISCOSITY**
 (i) Measure of the rate of flow of an oil. 2 x 1
 (ii) Gearbox and differential.
 (b) Wet oily deposits: Oil leakage at piston rings, valve guides or fuel pump.
 Sooty black deposit: Over choking, clogged air filter, excessive idling. 2 x 1
6. (a) Inlet valve clearance too small – opens too early and closes too soon hence reduce volumetric efficiency.
 Exhaust valve clearance too big - valve open too late hence high fuel consumption low volumetric efficiency 2 x 1½
- (b) Compression ratio

$$CR = \frac{DV - CV}{CV}$$
 Where $DV = \frac{\pi r^2 \times \text{stroke}}{4}$

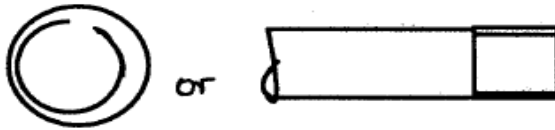
$$= \frac{22}{7} \times \frac{5010^2 \times 100}{20}$$

$$= 785.7 \text{ cc}$$

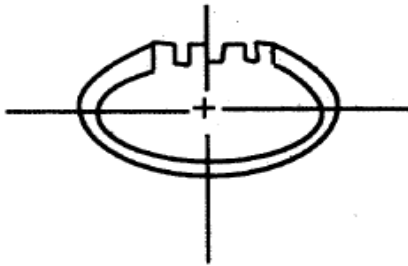
$$CR = \frac{785.7}{100} = 8.9:1$$
 6 x ½
7. (a) **FUNCTION**
 Synchronizer - matches the speed of countershaft
 Idler gear - facilitates change of motion to reverse
 Fork - selects preferred gear 3 x 1
- (b) **SYMBOLS**
 (i) 
 (ii) 
 (iii) 
 (iv)  4 x ½
8. (a) **MEASUREMENTS**
 (i) SPRING - Height and squareness
 (ii) CAMSHAFT - Lobe height, journal Ø 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 outlet stroke to allow a admission of more fresh 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)

10. **SYMBOLS**

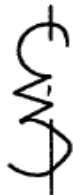
(a)



(b)

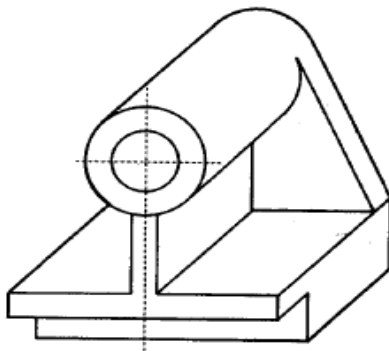


(c)



3 x 1

11.



<i>10 faces x 1</i>	<i>= 10</i>
<i>Oblique</i>	<i>= 1</i>
<i>Face X X at front</i>	<i>= 1</i>
<i>Dimensioning 3 x 1/2</i>	<i>= 1 1/2</i>
<i>Proportionality</i>	<i>= 1</i>
<i>Neat ness</i>	<i>= 1/2</i>
TOTAL	<u>= 15 marks</u>

12. (a) **SERVICE CHECKS**

Burnt faces
Face wastage
Face pitting
Stem bending
Scoring

Any 4 x 1/2

(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 x 1

(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 (1) should slow down and get noticeably rougher if that cylinder is firing.
- Repeat the (11) procedure for each of the three spark plugs. (11)
The plug that does not give any noticeable change is misfiring.
- Stop the engine and remove this plug. (11)
- Replace the plug with a good one. (11)
- 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, (11) replace the plug cable with a good one and try to notice the difference. (11)

9 x 1

13. (a) **ADVANTAGES OF PNEUMATIC 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 Reservoir
 - C Piston
 - D Valve
 - E Spring
 - F Seal

6 x 1/2

(c) **OPERATION
ENGAGEMENT**

- When the push rod moves into the cylinder it compresses the fluid. (1)
- Further movement closes the port to reservoir 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, (1) 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 reservoir by pass. (1)

(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.

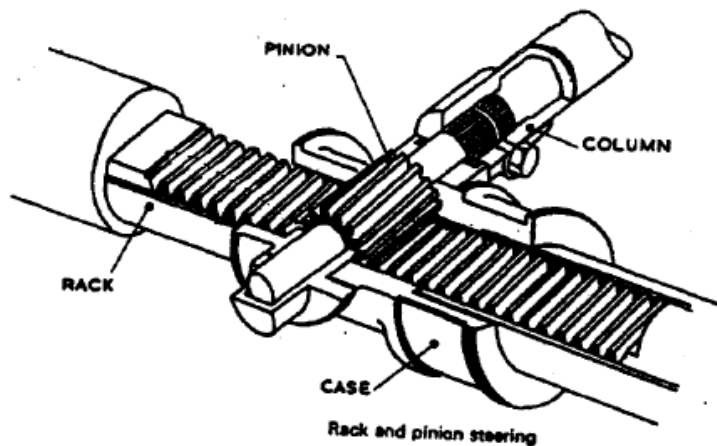
Any 3 x 1

(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)



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 ball 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;

- (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)