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PRACTICE PAPER - ANSWER BANK

Assessors Note:

This answer bank should be used as the primary resource when marking students work. However, responses to some questions may be subjective and tutors are advised to exercise their professional judgement when making assessment decisions.

ELEMENT ONE

Demonstrate knowledge of braking principles.

1. What is 'Friction'?

Friction is the force resisting the relative motion of solid surfaces, fluid layers, and material elements sliding against each other.

2. What is 'Kinetic Energy'?

The **kinetic energy** of an object is the energy which it possesses due to its motion.

3. What is the 'law' that relates to fluid in an enclosed system?

Pascal's law, states that when there is an increase in pressure at any point in a confined fluid, there is an equal increase at every other point in the container.

4. What is 'Vapour Lock'?

This is a term used when the brake fluid in a vehicle **brake system** is overheated and loses efficiency.

5. Name the component multiplies the brake pedal pressure to the master cylinder.

Brake booster

6. State whether TRUE or FALSE in the following statements. Write T or F in the box provided.

F The Proportioning valve limits the fluid pressure to the front brakes until the rear brake shoes have started to move.

F The pressure differential valve is responsible for warning the driver of low brake booster pressure.

F The metering valve regulates pressure differences to the front and rear brakes.

7. **What are the three types of brake calliper designs?**

1: Fixed 2: Sliding 3: Floating

8. **Brake lining or friction materials are manufactured to meet high standards. Name 3 qualities of good friction materials. Any 3 of the following.**

The two materials in contact must have a high coefficient of friction.

The materials in contact must resist wear effects, such as scoring.

The friction value should be constant over a range of temperatures and pressures

The materials should be resistant to the environment (moisture, dust, pressure)

The materials should possess good thermal properties, high heat capacity, good thermal conductivity, withstand high temperatures

Able to withstand high contact pressures

Should be safe to use and acceptable for the environment

9. **In the following statements state whether TRUE or FALSE.**

Hydraulic force is doubled at the wheel cylinder if the surface area of the master cylinder is half that of the piston in the wheel cylinder. **True**

The wheel cylinder piston travelling distance will be double that of the master cylinder's piston travelling distance, if the master cylinder piston area is double that of the wheel cylinder. **True**

10. **What are the THREE most common brake shoe configurations used on vehicles?**

1: Leading/Trailing

2: Duo-Servo

3: Twin Leading

11. Describe the working action of the' Duo Servo 'or self-energising brake shoe system

The curved top ends of each shoe fit against the round anchor pin. As the pistons move outward in the wheel cylinder, the shoe lining contacts the drum. The linked shoes attempt to rotate with the drum. With the vehicle traveling forward, the rear shoe stops against the anchor pin. Backing up, the front shoe stops against the anchor pin. The obstructed rotational force now redirects, pressing the shoes outward against the drum. This additional force, referred to as "self-energizing", is beyond driver input and hydraulic pressure. When self-energizing force can apply in either direction of rotation, the system is called duo-servo.

12. Describe the operation of a vacuum brake booster

Brake boosters have two or more chambers, divided by flexible diaphragms. The chamber is normally steel and the diaphragm is usually some form of rubber. They attach a metal push rod to the diaphragms and it moves with them. Vacuum, usually supplied by the engine and atmospheric pressure combine to provide the assistance during braking to multiply pedal pressure.

13. What is 'vehicle weight distribution' and describe its effect on brake operation?

When a vehicles brakes are applied the nose dips, and there is a transfer of weight from the rear to the front wheels. This makes the percentage of work that can be done by the front brakes before the onset of wheel lockup higher than what can be done by the rear brakes. A combination valve is used to assist in the proportioning of pressure to both front and rear brakes.

14. What is a height sensing brake proportioning valve?

The load sensing proportioning valves are often used on vehicles which operate with widely differing rear axle loads such as commercial vehicles. As the load on the rear axle increases, so does the amount of braking force that can be directed to the rear wheels. The load sensing proportioning valve automatically does this by varying the rear brake pressure in relation to vehicle ride height.

15. Why does a brake calliper have a square shouldered internal seal and not a round type?

The piston has a square seal that performs several functions. It seals hydraulic pressure in the cylinder. It also functions as a return spring for the piston to be pushed out to bring the pad into contact with the rotor. When hydraulic pressure is diminished, the seal functions as a return spring to retract the piston. In addition, as the front disc brake pads wear the seals allow the piston to move further out, to adjust automatically for the wear. If a round type were used the piston would not retract and cause the piston to remain in contact with the disc pad.

16. What is the purpose of the 'Self adjusting mechanism' in rear drum type brakes, and describe its function?

As the brake lining wears, the piston moves out to take up the clearance between the linings and drum using fluid pressure from the master cylinder. The self-adjusters can be activated by normal brake pedal operation, by hand brake lever movement or by reversing the vehicle and applying the brakes this takes up any added clearances due to friction lining wear.

17. What factors can influence brake performance?

- The time it takes the driver to apply the brakes
- The pressure available to apply the brakes
- The tyre tread depth, tyre pressures, tyre size.
- Tyres that do not meet manufacturer's specifications.
- The co-efficient of friction between the tyres and the road.
- The co-efficient of friction between the brake and the brake disc or drum.
- The brake's ability to dissipate the heat generated and maintain the frictional properties.
- The mass or weight of the vehicle.
- The speed that the vehicle is travelling at when the brakes are applied

ELEMENT TWO

Demonstrate knowledge of braking system componentry and operation.

1a. Name two types of hydraulic braking system circuits?

1: Diagonally split

2: Single brake circuit

1b Describe the operation of a 'Diagonal split braking system?'

Front-engined, front-wheel-drive vehicles use a braking system split in a diagonal or X. The left hand front brake unit is connected to the right hand rear unit, and the left hand rear, to the right hand front. If one system fails, a 50% braking capability is left in the other system. Dual proportioning valves maintain optimum braking in each system.

2. Name the two types of brake master cylinders and give a brief description of their operation?

Single piston and single reservoir type master cylinders have 1 piston and 1 reservoir. If a leak occurs within the circuit all hydraulic pressure is lost.

Tandem or dual reservoir type master cylinders have 2 reservoirs and a two pistons in tandem to 1 another. They will have 2 separate circuits and should a leak occur in one circuit then the remaining circuit will have some hydraulic pressure for half of the braking system to work.

3a. Explain the purpose of the check valve in a brake booster?

Vacuum boosters have an external one-way check valve at the hose inlet that closes when the engine is either shut off or stalls. This traps vacuum inside the booster so it can still provide one or two power assisted stops until the engine is restarted.

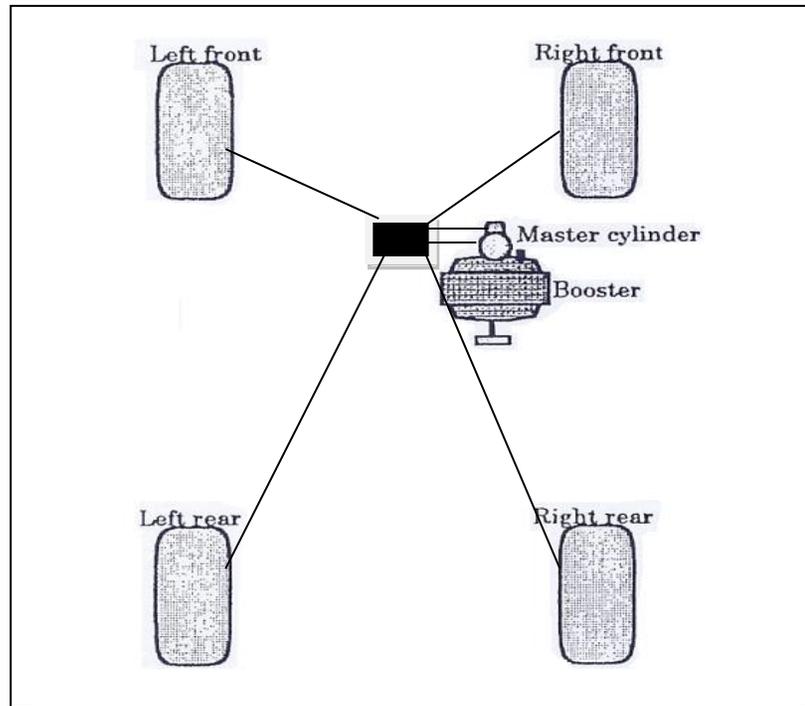
3b. Name 3 requirements for brake booster operation?

1: Brake pedal pressure

2: Vacuum

3: Atmospheric pressure

4. The diagram below shows an incomplete layout of a diagonally split braking system. Draw on the diagram below the brake pipes and the proportioning valve.



5. What type of brake calliper is generally found on motorcycles?

Fixed type

6. Describe the main difference between the floating and sliding calliper arrangements.

Floating disc callipers have pistons on one side of the disk and the caliper slides to apply pressure to both sides of the disk.

Sliding type are usually fixed and have 1 piston on either side of the disc.

7. Name three types of wheel cylinders?

1. Single-ended 2. Stepped 3. Double ended

8. If the brake pedal creeps to the floor under steady foot pressure, what could the problem be?

Master cylinder pressure leaking or bypassing the seals internally.

ELEMENT THREE

Demonstrate knowledge of electronic braking system componentry and operation.

1. Match up each braking system with its description

A	EBD	A2	1	Safety feature designed to prevent wheel lock up under emergency braking.
B	ABS	B1	2	Takes the place of a mechanically operated brake proportioning valve.
C	Brake Assist	C4	3	This brake system design uses a small electric motor near the wheels that generate the braking pressure.
D	Brake By Wire	D3	4	System detects if the driver is trying to execute an emergency stop, and if the brake pedal is not fully applied, the system overrides and fully applies the brakes.

2. Name the 3 types of anti-lock braking systems

- 1: One Channel
- 2: Three Channel
- 3: Four Channel

3. Explain the function of the **ONE** channel type abs system?

This system is mainly found on utility type vehicles with rear wheel ABS. It uses one valve which controls both rear wheels and one speed sensor. The ECU monitors the speed of the rear wheels by a speed sensor that is located in the final drive assembly. When rear wheel lock up is detected the ABS unit is activated, releasing brake fluid pressure and wheel lock up.

4. How are ABS sensors used in the “Traction Control System”?

The wheel speed sensors are used to provide the wheel speed information to both the ABS and TCS.