AUTOMOBILE ENGINEERING TECHNICIAN
Second Year
Paper-III: Auto Servicing and Maintenance

Time: 3hr **Max.Marks: 50**

Section - I **1X20=20**

1. Perform the Decarburisation processes.

Aim:

The aim of the decarburization process is to reduce the carbon content in a metal alloy, typically steel, to enhance its mechanical properties and refine its microstructure.

Materials:

High-carbon steel sample
Refractory-lined furnace
Decarburization medium (controlled atmosphere or oxygen-rich environment)

Tools:

Tongs
Thermocouple
Safety equipment (gloves, goggles)

Procedure:

Preparation: Secure the high-carbon steel sample.
Furnace Setup: Place the sample in a refractory-lined furnace.
Decarburization Medium: Choose either a controlled atmosphere or introduce oxygen for the decarburization process.
Heating: Gradually heat the steel to the decarburization temperature, ensuring uniformity.
Hold Time: Maintain the temperature for a specific duration to allow carbon diffusion.
Cooling: Gradually cool the sample to room temperature.

Precautions:

Safety Gear: Wear appropriate safety gear to protect against high temperatures and potential splashes.
Controlled Environment: Ensure a controlled atmosphere to regulate decarburization.
Temperature Monitoring: Regularly monitor and control the temperature using a thermocouple.
Handling: Use tongs for handling hot samples to prevent burns.

Result:

After the decarburization process, the steel exhibits reduced carbon content, leading to improved mechanical properties and a refined microstructure, enhancing its suitability for various industrial applications.

In summary, the decarburization process aims to enhance steel properties by reducing carbon content, requiring careful preparation, controlled heating, and safety measures to achieve optimal results.

2. Perform cylinder reboring method.

Aim:

To perform the cylinder reboring method to restore the correct internal diameter of an engine cylinder, ensuring optimal engine performance.

Materials:

Engine cylinder requiring reboring
Boring machine
Honing stones
Lubricating oil
Micrometer
Safety gear (gloves, goggles)

Tools:

Boring machine
Honing machine
Micrometer
Cylinder block clamp
Lubrication system for machines
Dial indicator

Procedure:

Secure the cylinder block using a suitable clamp.
Measure the current internal diameter using a micrometer.
Set up the boring machine with the appropriate tool and lubrication system.
Gradually bore the cylinder to the desired diameter, checking measurements periodically.
Finish the process by honing the cylinder with appropriate stones.
Measure the final diameter to ensure precision.
Clean the cylinder thoroughly to remove any debris.
Reassemble the engine components.

Precautions:

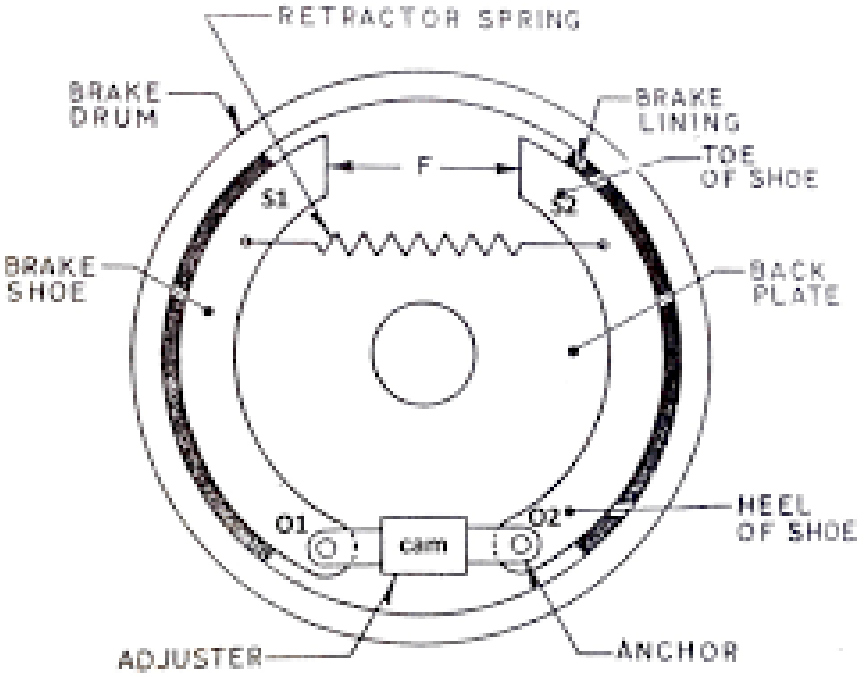
Wear appropriate safety gear to protect against machine operation hazards.
Ensure the work area is well-ventilated to disperse machining fumes.
Follow manufacturer guidelines for machine setup and tool usage.
Regularly check and calibrate measuring instruments.
Keep hands and clothing away from moving machine parts.
Monitor lubrication levels to prevent overheating.

Result:

The cylinder reboring process successfully restored the correct internal diameter, improving engine efficiency and ensuring optimal performance.

Note*:* Adapt the values and specific procedures according to the manufacturer's recommendations and the engine specifications.

3. Perform brake drum turning process.



Aim:
The aim of the brake drum turning process is to restore the braking surface of the drum to its original, smooth condition, thereby improving braking efficiency and eliminating brake-related issues.

Materials:

Brake drum in need of resurfacing
Lathe machine
Carbide cutting tool
Dial indicator
Micrometer
Safety gear (gloves, safety glasses, ear protection)
Brake cleaner
Emery cloth

Tools:

Lathe machine
Carbide cutting tool
Dial indicator
Micrometer
Brake drum caliper
Safety gear (gloves, safety glasses, ear protection)

Procedure:

Ensure safety gear is worn.
Mount the brake drum securely onto the lathe machine.
Set up the cutting tool and adjust its position.
Use the dial indicator to measure runout and adjust the setup if necessary.
Begin turning the brake drum at a slow speed.
Gradually move the cutting tool across the drum surface.
Measure the drum diameter with a micrometer to ensure uniform cutting.
Clean the turned drum surface with brake cleaner.
Use emery cloth to remove any remaining imperfections.
Reinstall the brake drum onto the vehicle.

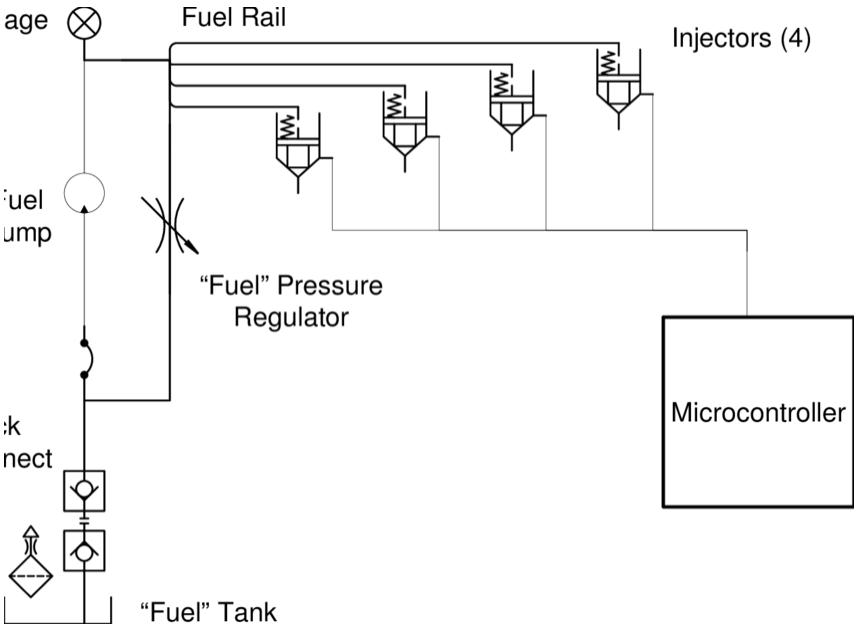
Precautions:

Follow safety guidelines and wear protective gear.
Ensure proper mounting of the brake drum on the lathe.
Double-check cutting tool alignment and lathe speed.
Regularly measure runout and diameter during the turning process.
Avoid excessive material removal to prevent drum weakening.
Keep the work area clean and well-ventilated.

Result:

Upon completion, the brake drum surface will be smooth and free of imperfections, leading to improved braking performance and increased safety on the road.

4. Perform phasing and calibration test on fuel injection test bench.



Aim:
To perform phasing and calibration tests on a fuel injection test bench to ensure accurate and efficient fuel delivery in an internal combustion engine.

Materials:

Fuel injection test bench
Fuel injector
Pressure gauge
Timing light
Wrenches
Screwdrivers
Calibration fluid
Tachometer

Tools:

Timing light
Pressure gauge
Wrench set
Screwdriver set
Tachometer

Procedure:

Phasing Test:
a. Connect the fuel injector to the test bench.
b. Set up the timing light and connect it to the engine.

c. Start the test bench and adjust the timing until it synchronizes with the light.

Calibration Test:
a. Attach the pressure gauge to the fuel system.
b. Gradually increase the pressure and observe injector response.
c. Adjust the pressure to the specified values and note any deviations.

d. Check injector spray pattern and adjust if necessary.

Precautions:

Ensure proper ventilation to minimize exposure to fuel fumes.
Follow safety guidelines for working with pressurized systems.

Disconnect electrical connections before making adjustments.
Use appropriate personal protective equipment (PPE).

Result:

The phasing and calibration tests ensure optimal injector timing and fuel delivery, promoting efficient combustion and engine performance.

5. Servicing of four wheeler brakes.

Aim:

The aim of this practical task is to perform the servicing of four-wheeler brakes, ensuring optimal braking efficiency and safety.

Materials:

Brake fluid
Brake cleaner
Brake pads
Brake rotor
Brake caliper grease

Tools:

Jack and jack stands
Lug wrench
C-clamp
Brake fluid reservoir cap wrench
Brake bleeder kit
Wrench and socket set
Screwdriver
Brake caliper tool

Procedure:

Lift the vehicle using a jack and secure it with jack stands.
Remove the wheel using a lug wrench.
Locate the brake caliper, remove the caliper bolts, and detach the caliper.
Use a C-clamp to compress the caliper piston back into the caliper housing.
Remove the old brake pads and inspect the brake rotor for wear.
Install new brake pads and, if necessary, replace the brake rotor.
Reattach the brake caliper, ensuring bolts are torqued to specifications.

Bleed the brake system using a brake bleeder kit to remove air from the brake lines.
Top up the brake fluid reservoir with the appropriate brake fluid.
Reinstall the wheel and lower the vehicle.

Precautions:

Ensure the vehicle is on a level surface before lifting.
Use proper safety gear, including gloves and safety glasses.
Follow vehicle-specific torque specifications for caliper bolts.
Dispose of old brake fluid and brake components responsibly.

Result:

Following this brake servicing procedure enhances braking performance, ensures even brake pad wear, and promotes overall driving safety. Regular brake maintenance is crucial for the longevity and effectiveness of the braking system.

Section - II 1X10=20

6. Perform the valve seat grinding process.

Aim:

The aim of the valve seat grinding process is to restore the proper sealing surface between the valve and its seat in an internal combustion engine, ensuring optimal engine performance and efficiency.

Material:

Materials required for valve seat grinding include grinding compound, lapping oil, and replacement valve seats if needed.

Tools:

Valve seat grinding machine
Grinding stones of various sizes
Valve lapping tool
Valve guide pilots
Micrometer
Valve seat cutters (if necessary)

Procedure:

Inspect and disassemble: Remove the cylinder head, inspect the valves and valve seats for wear or damage, and disassemble the necessary components.
Clean surfaces: Thoroughly clean the valve and valve seat surfaces, removing any carbon deposits or other contaminants.
Grinding: Use the valve seat grinding machine and appropriate grinding stones to carefully and evenly grind the valve seats. Ensure a smooth and precise finish.
Lapping: Apply grinding compound to the valve seat and use a lapping tool to further refine the surface for optimal sealing. Perform this process until a uniform, polished finish is achieved.
Final inspection: Measure the valve seat width with a micrometer to ensure it meets specifications. Check the valve-to-seat contact pattern for uniformity.

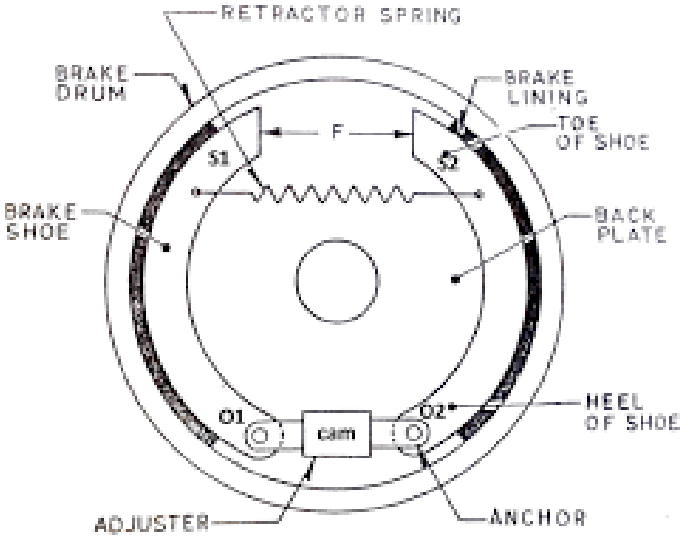
Precautions:

Protective gear: Wear safety glasses and gloves to protect against grinding debris.
Careful grinding: Avoid excessive material removal, as it may affect valve seating and engine performance.
Cleanliness: Keep the work area and components clean to prevent contamination during reassembly.

Result:

Upon completion of the valve seat grinding process, a properly restored valve seating surface is achieved, promoting effective sealing between the valve and its seat. This contributes to improved engine performance and efficiency.

7. Perform brake shoe riverting process.



Aim:
The aim of the brake shoe riveting process is to securely attach the brake lining to the brake shoe, ensuring effective braking performance in automotive applications.

Materials:

Brake Shoes
Brake Linings
Rivets

Tools:

Riveting Machine
Hammer
Drill
Anvil

Procedure:

Preparation: Ensure that the brake shoe and lining materials are clean and free of contaminants.
Drilling: Drill holes in the brake shoe where the rivets will be inserted.
Inserting Rivets: Place the brake lining onto the brake shoe, aligning the drilled holes. Insert rivets through the holes.
Riveting: Use a riveting machine to deform the rivet ends, securing the brake lining in place. Hammer may be used for manual riveting.
Inspection: Inspect the riveted assembly for uniformity and secure attachment.

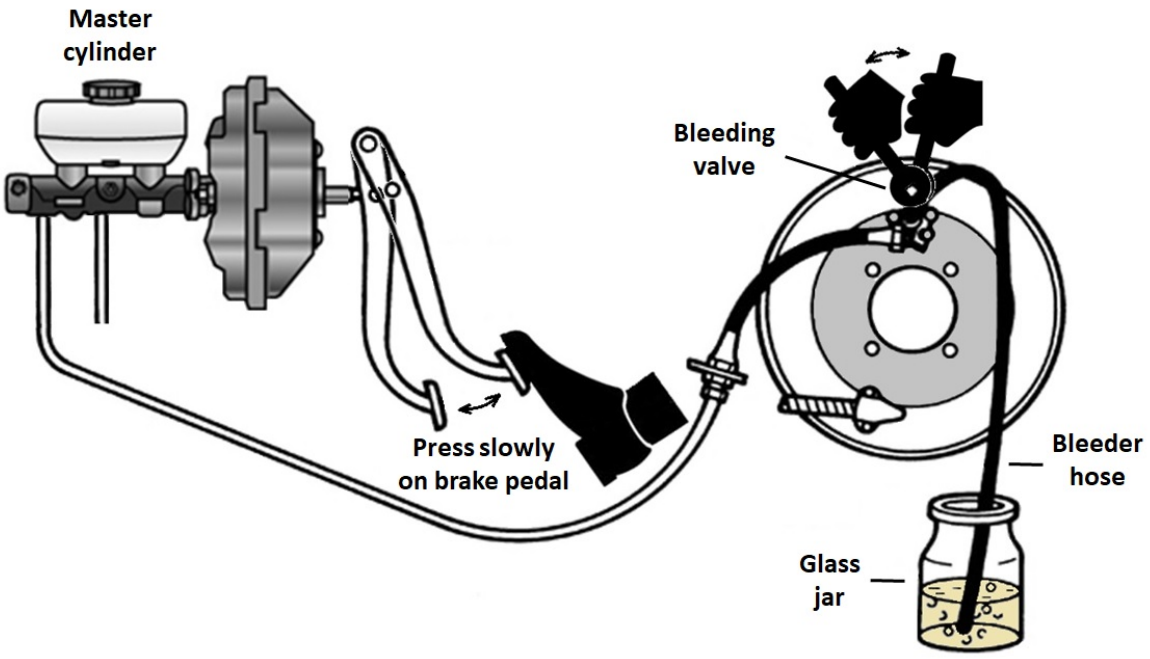
Precautions:

Safety Gear: Wear safety goggles and gloves to protect against potential hazards.
Precision: Ensure accurate alignment during the riveting process to prevent uneven brake wear.
Ventilation: Perform the task in a well-ventilated area to mitigate exposure to any fumes or dust produced.

Result:

The brake shoe riveting process, when executed with precision, results in a securely attached brake lining to the shoe, ensuring optimal braking efficiency and safety in automotive applications.

8. Perform brake bleeding process.



Aim:
The aim of the brake bleeding process is to remove air bubbles from the brake system, ensuring optimal brake performance and responsiveness.

Materials:

Brake fluid
Clear plastic tubing
Brake bleeding kit or wrench
Brake fluid reservoir cap

Tools:

Jack and jack stands
Lug wrench
Brake fluid catch container
Turkey baster or syringe (optional)

Procedure:

Lift the vehicle using a jack and secure it with jack stands.
Remove the wheels using a lug wrench.
Locate the brake bleeder valve on each brake caliper or wheel cylinder.
Attach a clear plastic tubing to the bleeder valve and submerge the other end in a container filled with brake fluid.

With a helper in the driver's seat, open the bleeder valve using a brake bleeding kit or wrench and have them pump the brake pedal several times.
Close the bleeder valve, then repeat the process until no air bubbles are visible in the tubing.
Check and top up the brake fluid reservoir as needed during the bleeding process.

Precautions:

Always use the recommended brake fluid for your vehicle.
Avoid letting the brake fluid reservoir run dry to prevent air from entering the system.
Wear safety glasses to protect your eyes from brake fluid splashes.
Tighten the bleeder valve securely to prevent leaks.
Follow the vehicle manufacturer's specifications for the proper bleeding sequence.

Result:

Upon completion of the brake bleeding process, the brake system should exhibit improved pedal feel and responsiveness, ensuring the effective removal of air from the system and promoting safe and efficient braking.

9. Perform fuel injector pressure test,spray test,and leak of test.

Aim:

The aim of this practical is to perform a comprehensive fuel injector analysis, including a pressure test, spray test, and leak test, to assess the functionality and integrity of the fuel injector.

Materials:

Fuel pressure gauge
Spray pattern tester
Leak-down tester
Safety goggles
Latex gloves
Rags
Fuel injector cleaner

Tools:

Wrench set
Screwdriver

Fuel pressure regulator adapter
Hose clamps
Container for fuel drainage

Procedure:

Pressure Test:
a. Disconnect the fuel pump fuse.
b. Connect the fuel pressure gauge to the fuel rail.
c. Turn the ignition key to the ON position.

d. Record the pressure reading; it should meet manufacturer specifications.

Spray Test:
a. Remove the fuel injector.
b. Connect the spray pattern tester.

c. Activate the injector to observe a uniform and cone-shaped spray pattern.

Leak-down Test:
a. Remove the injector from the engine.
b. Connect the leak-down tester to the injector.

c. Pressurize the system and monitor for any pressure drop, indicating leaks.

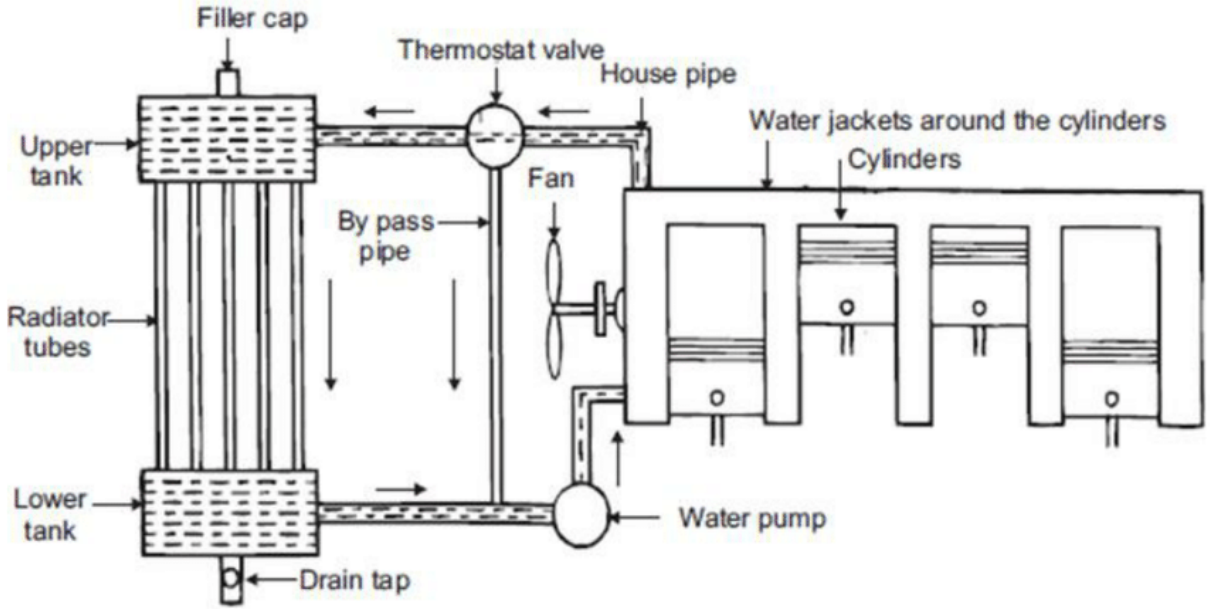
Precautions:

Ensure proper ventilation in the workspace due to potential exposure to fuel vapors.
Wear safety goggles and latex gloves to protect eyes and skin.
Keep a fire extinguisher nearby and avoid smoking during the procedure.
Work in a well-lit area to accurately observe test results.
Follow manufacturer guidelines for handling and disposing of fuel and cleaning agents.

Result:

Upon completion of the tests, a properly functioning fuel injector will exhibit the specified pressure, a uniform spray pattern, and minimal or no pressure drop during the leak-down test. Any deviations may indicate issues requiring further inspection or maintenance, ensuring optimal engine performance and fuel efficiency.

10. Servicing and checking of four wheeler cooling system.



Aim:
The aim of this practical exercise is to perform a comprehensive servicing and checking of a four-wheeler cooling system to ensure optimal functionality and prevent potential issues.

Materials:

Coolant
Distilled water
Thermostat
Radiator flush solution
Hose clamps
Hose replacement (if necessary)

Tools:

Screwdriver
Pliers
Funnel
Cooling system pressure tester
Drain pan
Jack and jack stands

Procedure:

Preparation:

a. Park the vehicle on a flat surface.
b. Allow the engine to cool completely.

c. Identify and locate the radiator, hoses, thermostat, and coolant reservoir.

Draining the System:
a. Place the drain pan under the radiator drain plug.

b. Open the radiator drain plug and allow the coolant to drain completely.

Flushing:
a. Close the drain plug and add a radiator flush solution.
b. Start the engine and let it run for the specified time on the flush solution.

c. Drain the flush solution from the radiator.

Replacing Thermostat:
a. Remove the thermostat housing.
b. Replace the thermostat with a new one.

c. Ensure proper sealing and reattach the housing.

Refilling and Pressure Testing:
a. Mix coolant with distilled water as per the manufacturer's specifications.
b. Use a funnel to pour the coolant mixture into the radiator.

c. Start the engine and use a cooling system pressure tester to check for leaks.

Precautions:

Always wear protective gear, including gloves and safety glasses.
Never attempt to open the radiator cap when the engine is hot.
Dispose of used coolant and flush solution in an environmentally friendly manner.

Result:

Following the above steps ensures the four-wheeler cooling system is serviced effectively, promoting efficient heat dissipation and preventing potential overheating issues, thereby enhancing the overall performance and longevity of the vehicle.