



**BANGLADESH TECHNICAL EDUCATION BOARD**  
Agargaon, Dhaka-1207

**4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM**  
**SYLLABUS (PROBIDHAN-2016)**

**AUTOMOBILE TECHNOLOGY**

TECHNOLOGY CODE: **662**

5th SEMESTER

DIPLOMA IN ENGINEERING  
PROBIDHAN-2016

**AUTOMOBILE TECHNOLOGY (662)**

**5<sup>th</sup> SEMESTER**

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	66251	Automotive Suspension & Power Transmission System	2	6	4	40	60	50	50	200
2	66252	Automotive Two & Three wheeler	2	3	3	40	60	25	25	150
3	66253	Automobile Air- Conditioning	2	3	3	40	60	25	25	150
4	67153	Engine Overhauling & Inspection	2	6	4	40	60	50	50	200
5	67143	Fuels & Lubricants	2	3	3	40	60	25	25	150
6	65851	Accounting Theory & Practice	2	3	3	40	60	50	0	150
<b>Total</b>			<b>12</b>	<b>24</b>	<b>20</b>	<b>240</b>	<b>360</b>	<b>225</b>	<b>175</b>	<b>1000</b>

**AIMS**

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automotive suspension, brake and power transmission with special emphasis on:

- construction and operation of suspension system
- construction and operation of power train

**SHORT DESCRIPTION**

Features of suspension system, suspension springs, shock absorber; Non-conventional suspension system; Power transmission system; Features of conventional clutch, clutch plate, gear box; Non-conventional clutch;; Fluid coupling and torque converter; Automatic gear box; Propeller shaft; Differential gear; Axle and CV joint; Power steering system; Steering geometry; Brake system; Master cylinder; Non-conventional brake system; Brake system servicing.

**DETAIL DESCRIPTION****Theory:****1. Understand the features of suspension system.**

- 1.1 Define the term suspension system.
- 1.2 Mention the purposes of suspension system.
- 1.3 Define the basic suspension movements viz- bouncing, pitching and rolling.
- 1.4 Mention the classification of suspension system.
- 1.5 Define the terms conventional suspension system.
- 1.6 Define the terms independent suspension system.
- 1.7 Describe the operation of wishbone & macpherson type independent front suspension system.
- 1.8 Describe the operation of each type of independent rear suspension.
- 1.9 List the advantages of independent front suspension and rear suspension.

**2. Understand the features of spring.**

- 2.1 Mention the purposes of suspension spring.
- 2.2 Name the types of spring used in suspension system.
- 2.3 Define sprung weight and un-sprung weight.
- 2.4 List the components under sprung weight and un-sprung weight.
- 2.5 Describe the construction of different types of leaf spring.
- 2.6 Describe the operation of different types of leaf spring.
- 2.7 Describe the operation of coil spring.
- 2.8 Describe the procedure of maintenance of leaf spring.

**3. Understand the features of shock absorber.**

- 3.1 Mention the purposes of shock absorber.
- 3.2 Identify the types of shock absorber.
- 3.3 Describe the operation of telescopic type shock absorber.
- 3.4 Describe the operation of lever type shock absorber.
- 3.5 Describe the construction of adjustable shock absorber.
- 3.6 Describe the construction of air shock absorber/ gas filled shock absorber.
- 3.7 Describe the construction of sensor controlled shock absorber.

#### **4. Understand the non-conventional suspension system.**

- 4.1 Describe the operation of conventional air suspension system.
- 4.2 Mention the advantages of air suspension system.
- 4.3 Describe the construction & operation of electronically controlled air suspension system.
- 4.4 Mention the advantage of electronic air suspension system.
- 4.5 Describe active suspension system.
- 4.6 Describe the operation of active suspension system.
- 4.7 Describe the operation of torsion bar.
- 4.8 Describe the operation of stabilizer bar or sway bar.
- 4.9 Describe the trouble shooting procedures of suspension system.

#### **5. Understand the features of power transmission system.**

- 5.1 Define the power train or power transmission system.
- 5.2 List the main components of power train.
- 5.3 Name the different types of power train.
- 5.4 Describe the operation of power train of each type.

#### **6. Understand the features of conventional clutch.**

- 6.1 Define clutch.
- 6.2 Mention the function of clutch.
- 6.3 Name the different types of clutch.
- 6.4 Describe the construction & operation of coil spring clutch.
- 6.5 Describe the construction & operation of diaphragm spring clutch.
- 6.6 Mention the functions of pressure plate, release bearing, release lever and eyebolt.
- 6.7 Mention the function of clutch plate.
- 6.8 Describe the construction of clutch plate.
- 6.9 Mention the characteristics of clutch facing or clutch liner.

#### **7. Understand the features of non-conventional clutch.**

- 7.1 Describe the operation of centrifugal clutch.
- 7.2 Describe the operation of semi-centrifugal clutch.
- 7.3 Describe the operation of hydraulic linkage of clutch.
- 7.4 Describe the operation of electronically controlled clutch.
- 7.5 Explain different adjustments of clutch, floor board clearance adjustment, clutch free play adjustment, clutch pedal travel adjustment and clutch release lever adjustment.
- 7.6 Describe the trouble shooting and diagnosis of clutch mechanism.

#### **8. Understand the features of gearbox.**

- 8.1 Mention the purposes of gearbox.
- 8.2 Name the different types of gear box used in automobile.
- 8.3 Explain principle of gearing.
- 8.4 Identify the types of gear used in automobile.
- 8.5 Describe the operation of sliding mesh gearbox.
- 8.6 Describe the operation of constant mesh gearbox.
- 8.7 Describe the construction and operation of synchromesh unit.
- 8.8 Describe the operation of synchromesh gearbox.
- 8.9 List the advantages of synchromesh gearbox.
- 8.10 Describe the characteristics and operation of manual Transaxle system.
- 8.11 Describe the operation of overdrive mechanism.
- 8.12 Explain the advantages of overdrive mechanism.

**9. Understand the features of automobile transmission.**

- 9.1 Define fluid coupling and torque converter.
- 9.2 Describe the operation of fluid coupling.
- 9.3 Describe the operation of torque converter.
- 9.4 Compare between the fluid coupling and torque converter.
- 9.5 Mention the classification the automatic gearbox.
- 9.6 Describe the operation planetary gear mechanism.
- 9.7 Describe the hydraulic control system of auto gear.
- 9.8 Describe the operation of automatic gearbox.

**10. Understand the feature of advance transmission system.**

- 10.1 State the meaning of electronic control Transmission (ECT) and continuously variable Transmission(CVT).
- 10.2 Mention the advantage of ECT and CVT system.
- 10.3 Describe the construction and operation of ECT and CVT system.

**11. Understand the feature of propeller shaft.**

- 11.1 Mention the functions of propeller shaft.
- 11.2 Name the different types of propeller shaft.
- 11.3 Describe the construction of different types of propeller shaft.
- 11.4 Mention the function of slip joint & universal joint.
- 11.5 Define the term rear end torque.
- 11.6 Explain the principle of resisting rear end torque by Hotchkiss drive and torque tube drive.
- 13.7 Describe the trouble shooting procedure of propeller shaft.

**12. Understand the features of differential.**

- 12.1 Mention the function of differential.
- 12.2 Name the different types of differential.
- 12.3 Describe the working principle of differential.
- 12.4 Describe the construction of conventional differential.
- 12.5 Describe the operation of conventional differential.
- 12.6 Describe the construction of non-slip differential.
- 12.7 Describe the operation of non-slip differential.
- 12.8 Describe the construction and operation of double reduction differential.
- 12.9 Describe the trouble shooting procedure of differential.

**13. Understand the features of axles and CV joint.**

- 13.1 Define the term axle and CV joint.
- 13.2 Mention the classification of axles.
- 13.3 Mention the function of live axle.
- 13.4 Describe the operation of full floating, semi floating and three quarter floating axle.
- 13.5 Describe the construction of front drive axle.
- 13.6 Name the different types of CV joint.
- 13.7 Describe the operation of inner CV joint and outer CV joint.
- 13.8 Mention the causes of axle failures.

## **PRACTICAL:**

### **1. Perform servicing of the suspension system.**

- 1.1 Identify the components of suspension system.
- 1.2 Identify the conventional suspension system.
- 1.3 Identify the independent suspension system.
- 1.4 Identify the sprung weight and unsprung weight.

### **2. Perform servicing of the coil spring.**

- 2.1 Remove the coil spring from chassis.
- 2.2 Test the coil spring.
- 2.3 Reinstall the spring on chassis.

### **3. Perform servicing of the leaf spring.**

- 3.1 Remove the leaf spring set from chassis.
- 3.2 Disassemble and clean the leaf spring.
- 3.3 Lubricate the leaves and assemble.
- 3.4 Install the spring set at chassis.

### **4. Perform servicing of shock absorber.**

- 4.1 Remove the shock absorber from chassis.
- 4.2 Test its workability.
- 4.3 Install the shock absorber at chassis.

### **5. Perform servicing of the sway bar or torsion bar.**

- 5.1 Remove the sway bar or Torsion bar.
- 5.2 Reinstall the sway bar or Torsion bar.

### **6. Perform servicing of the power train or power transmission system.**

- 6.1 Identify the components of power train.
- 6.2 Identify the different types of power train.

### **7. Practice to replace clutch assembly.**

- 7.1 Disconnect the clutch assembly from chassis.
- 7.2 Remove the clutch assembly from chassis.
- 7.3 Reinstall it at chassis.

### **8. Perform servicing of the coil spring type clutch assembly.**

- 8.1 Disassemble the clutch assembly.
- 8.2 Clean and test the workability of each component.
- 8.3 Assemble the clutch.

### **9. Perform servicing of the diaphragm spring clutch.**

- 9.1 Disassemble the clutch assembly.
- 9.2 Clean and test the workability of each component.
- 9.3 Assemble the clutch.

### **10. Perform servicing of the clutch plate.**

- 10.1 Remove the rivets of clutch plate and separate the clutch facings.
- 10.2 Test the workability to each component.
- 10.3 Again rivet the clutch facings or liners.

### **11. Perform servicing of the centrifugal clutch assembly.**

- 11.1 Disassemble the centrifugal clutch assembly.

11.2 Clean and test the each component.

11.3 Assemble the clutch assembly.

**12. Perform servicing of the clutch adjustments.**

12.1 Adjust the floor board clearance.

12.2 Adjust the clutch free play.

12.3 Adjust the clutch pedal travel.

12.4 Adjust the clutch release lever.

**13. Practice to replace gearbox from chassis.**

13.1 Disconnect gearbox from chassis.

13.2 Remove the gearbox from chassis.

13.3 Reinstall the gearbox at chassis.

**14. Perform servicing of the synchromesh gearbox.**

14.1 Disassemble the gearbox and identify each component.

14.2 Clean and test the workability of each component.

14.3 Assemble the gearbox.

**15. Perform servicing of the fluid coupling.**

15.1 Disassemble the fluid coupling.

15.2 Clean and test each component.

15.3 Assemble the fluid coupling.

**16. Perform servicing of the torque converter.**

16.1 Disassemble the torque converter.

16.2 Clean and test the each component.

16.3 Assemble the torque converter.

**17. Perform the replacement of propeller shaft.**

17.1 Disassemble the propeller shaft and remove.

17.2 Clean and test the universal joint and slip joint.

17.3 Reinstall the propeller shaft at chassis.

**18. Perform servicing of the universal joint.**

18.1 Disassemble the universal joint.

18.2 Clean the each component and test its workability.

18.3 Assemble the universal joint.

**19. Perform servicing of the differential.**

19.1 Disassemble the differential.

19.2 Clean the each component and test its workability.

19.3 Test the backlash of meshed gears of differential.

19.4 Assemble the differential.

**20. Perform the replacement of rear axle.**

20.1 Remove the wheel.

20.2 Remove the axle from chassis.

20.3 Clean and test the axle.

20.4 Reinstall the axle at chassis.

**21. Perform servicing of the CV joint.**

21.1 Remove the CV joint.

21.2 Disassemble and clean the component.

21.3 Test the workability of components.

21.4 Assemble and reinstall the CV joint.

### **REFERENCE BOOKS**

1. Automotive Mechanics. – W. H Crouse and Angilin
2. Automobile Engineering -- Dr. Kripal Singh.
3. Automobile Engineering – G. B. S Narang
4. Suspension, Brake and Power Transmission system - Md. Mussadek Hossain

**AIMS**

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automotive two and three wheelers with special emphasis on:

- Specification of automotive two and three wheelers
- Construction and operation of different system
- Servicing of two and three wheelers
- Trouble shooting and diagnosis

**SHORT DESCRIPTION**

Specification of two and three wheelers; Engine of two and three wheelers; Fuel system, Lubricating system; Starting system; Clutch mechanism; Gear transmission; Chain drive mechanism; Differential & propeller shaft; Steering system; Suspension system; Brake system; Ignition system; Lighting system, electric motor operated two & three wheelers. Trouble shooting & diagnosis.

**DETAIL DESCRIPTION****Theory:****1. Understand the specification of two wheelers and three wheelers.**

- 1.1 Define motor cycle, scooter & mopped.
- 1.2 Mention the specification of engines of two wheelers of different models and brands
- 1.3 Mention the specification of engines of three wheeler of different models & brands.
- 1.4 List the common brands and models of two wheelers and three wheelers using in Bangladesh.
- 1.5 Compare among the motor cycle, Scooter & Mopped.

**2. Understand the construction of two stroke engine of two & three wheeler.**

- 2.1 Describe the construction of two stoke engine of two & three wheeler.
- 2.2 Describe the operation of two stoke engine of two & three wheeler.
- 2.3 Describe the constriction of four stoke engine of two & three wheeler.
- 2.4 Describe the operation of four stoke engine of two & three wheeler.
- 2.5 Mention the difference in construction between the engines of two or three wheeler & a car.

**3. Understand the features of fuel system of two wheeler and three wheeler.**

- 3.1 Describe the operation of petrol fuel system of two wheelers.
- 3.2 Describe the operation of petrol fuel system of three wheelers.
- 3.3 Describe the operation of CNG fuel system of three wheelers.
- 3.4 Describe the construction of each components of CNG fuel system of three wheelers.
- 3.5 Mention the function of each components of CNG fuel system of three wheelers.
- 3.6 Describe the tuning procedure of CNG fuel system.

**4. Understand the features of lubricating system of two wheelers and three wheelers.**

- 4.1 Name the different types of lubricating system of two wheelers.
- 4.2 Describe the operation of lubricating system of two wheelers.
- 4.3 Name the different types of oil pump used in two wheelers.

- 4.4 Name the different types of lubricating system used in three wheelers.
  - 4.5 Describe the operation of lubricating system of three wheeler.
  - 4.6 Name the different types of oil pump used in three wheelers.
  - 4.7 Describe the operation of oil pump of two & three wheelers.
- 5. Understand features of starting system of two wheelers and three wheelers.**
- 5.1 Name the different types of starting system used in two wheelers.
  - 5.2 Describe the operation of manual starting system of two wheelers.
  - 5.3 Describe the operation of electric motor starting system of two wheelers.
  - 5.4 Name the different types of starting system used in three wheelers.
  - 5.5 Describe the operation of manual starting system of three wheelers.
  - 5.6 Describe the operation of electric motor starting system of three wheelers.
- 6. Understand the features of power transmission system of two wheelers and three wheelers.**
- 6.1 Define clutch, gearbox, differential, propellershaft.
  - 6.2 Mention the purpose of clutch, gearbox, differential, propellershaft.
  - 6.3 Mention the type of clutch, gearbox, differential, propellershaft used in two wheelers and three wheelers.
  - 6.4 Describe the construction of clutch, gearbox, differential, propellershaft of two and three wheeler.
  - 6.5 Describe the operation of clutch, gearbox, differential, propellershaft of two & three wheeler .
  - 6.6 Describe the adjusting Mechanism of clutch of two and three wheelers.
  - 6.7 Describe the gear adjusting mechanism of two & three wheelers.
  - 6.8 Describe the chain adjusting mechanism of two & three wheelers.
- 7. Understand the features of steering system of two wheelers and three wheelers.**
- 7.1 Mention the purposes of steering system.
  - 7.2 Describe the construction and operation of steering system of two wheelers.
  - 7.3 Describe the construction and operation of steering system of three wheelers.
- 8. Understand the suspension system of two wheelers and three wheelers.**
- 8.1 Mention the purposes of suspension system.
  - 8.2 Describe the construction & operation of suspension system of two wheelers.
  - 8.3 Describe the construction & operation of front suspension system of three wheelers.
  - 8.4 Describe the construction & operation of rear suspension system of three wheelers.
- 9. Understand the features of brake system of two wheelers and three wheelers.**
- 9.1 Mention the purposes of brake system.
  - 9.2 Name the different types of brake system used in two wheelers.
  - 9.3 Describe the construction & operation of mechanical brake system used in two wheelers.
  - 9.4 Describe the construction & operation of hydraulic brake system used in two wheelers
  - 9.5 Describe the construction & operation of hydraulic brake system of three wheelers.
  - 9.6 Describe the construction & operation of master cylinder of three wheelers
  - 9.7 Describe the construction & operation of wheel cylinder of three wheelers.
  - 9.8 Compare disk and drum type brake used in two wheelers
  - 9.9 Describe the brake adjusting procedure.
- 10. Understand the features of ignition system of two wheelers and three wheelers.**
- 10.1 Define ignition system.
  - 10.2 Mention the purposes of ignition system.

- 10.3 Describe the operation of different ignition system of two wheelers.
- 10.4 Describe the operation of different ignition system of three wheelers.
- 10.5 Describe the construction of spark plug.

**11. Understand the features of lighting system of two wheelers and three wheelers.**

- 11.1 List the lighting system used in two wheelers.
- 11.2 Draw a circuit diagram of lighting system of two wheelers.
- 11.3 List the lighting system used in three wheelers.
- 11.4 Draw a circuit diagram of lighting system of three wheelers.

**12. Understand the features of electrical motor operated two wheelers and three wheelers.**

- 12.1 Define electrical motor operated vehicle.
- 12.2 Mention the advantages & disadvantages of motor operated two & three wheeler.
- 12.3 Describe the construction of motor operated two & three wheeler.
- 12.4 Describe the operation of motor operated two & three wheeler.
- 12.5 Describe the construction of Brushless motor.
- 12.6 Mention the advantages of Brushless motor.
- 12.7 Compare the electrical motor operated two & three wheeler with engine operated two & three wheeler.
- 12.8 Describe the operation of speed controller of motor operated two & three wheeler.
- 12.9 Describe the operation of battery charger of motor operated two & three wheeler.

**13. Understand the trouble shooting and diagnosis of automotive two wheelers and three wheelers.**

- 13.1 List the common problems arise in engine of two wheelers and three wheelers.
- 13.2 Find out the causes and remedies of the engine problems.
- 13.3 List the common problems arises in power transmission system of two wheelers and three wheelers .
- 13.4 Find out the causes and remedies of problems of power transmission system of two wheelers and three wheelers .

**PRACTICAL:**

**1. Identify the different system & components of two wheelers.**

- 1.1 Identify the different systems of two wheelers.
- 1.2 Identify the components of different system.

**2. Identify the different system & components of three wheelers automobile.**

- 2.1 Identify the different systems of three wheelers.
- 2.2 Identify the components of different system.

**3. Remove and reinstall the engine of two wheelers from chassis.**

**4. Remove and reinstall the engine of three wheelers from chassis.**

**5. Disassemble and assemble the engine of two wheelers.**

**6. Disassemble and assemble the engine of three wheelers.**

**7. Perform servicing of CNG fuel system of three wheelers.**

- 7.1 Identify the components of CNG fuel system.

7.2 Remove all components from the engine.

7.3 Reinstall the components.

7.4 Start the engine.

7.5 Test the performance of the CNG system.

**8. Perform servicing of the clutch mechanism of two & three wheelers.**

8.1 Identify the components of clutch mechanism of two wheelers.

8.2 Remove clutch assemble and disassemble.

8.3 Clean and assemble the components.

8.4 Reinstall the clutch.

8.5 Test the performance of clutch assembly.

**9. Perform servicing of the gear transmission of two wheelers.**

9.1 Identify the components of gear transmission of two wheelers.

9.2 Remove and disassemble the gear transmission.

9.3 Clean and assemble the components.

9.4 Reinstall the gear transmission.

9.5 Test the performance of gear transmission.

**10. Perform servicing of the gear transmission of three wheelers.**

10.1 Identify the components of gear transmission of three wheelers.

10.2 Disassemble the gear assemble.

10.3 Clean and assemble the gear assemble.

10.4 Test the performance of gear transmission.

**11. Perform servicing of the mechanism of drive chain of two & three wheelers.**

11.1 Identify the components of drive chain mechanism.

11.2 Disassemble the components.

11.3 Clean and assemble the components.

11.4 Test the performance.

**12. Perform servicing of the brake system of two & three wheelers.**

12.1 Identify the components of brake system of two wheelers.

12.2 Disassemble the brake system of two wheelers.

12.3 Clean and assemble the system.

12.4 Adjust the brake shoe clearance.

12.5 Test the performance.

**13. Perform servicing of the operation of electric motor operated two & three wheeler.**

13.1 Identify the components of electrical motor operated two & three wheeler.

13.2 Remove the components of electrical motor operated two & three wheeler.

13.3 Disassemble and assemble of the motor.

13.4 Test the batteries performance.

13.5 Reinstall & complete the circuit.

13.6 Test the operation of the circuit.

**REFERENCE BOOKS**

1. Automobile Engine - By G. B. S. Narang.
2. Small Engines - by American Association for Vocational Instructional Materials.
3. Manuals of Different Two Wheelers and Three Wheelers.
4. Motor Cycle mechanics - LynnMoshier.

**AIMS**

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of basic refrigeration and auto air-conditioning with special emphasis on:

- Refrigeration science.
- Different methods of refrigeration.
- Components and accessories of refrigeration cycle.
- Refrigerants.
- Air-conditioning fundamentals
- Automobile bus air conditioning system
- Van & Trailer refrigeration system
- Automobile air-conditioning system and servicing.

**SHORT DESCRIPTION**

Refrigeration science; Different methods of refrigeration; Vapor compression cycle components and accessories; Refrigerants; Air-conditioning fundamentals; Automobile air conditioner; Automobile air conditioner control system; Automobile bus air conditioning system; Van & Trailer refrigeration system, Automobile air conditioner servicing.

**DETAIL DESCRIPTION****Theory:****1. Understand the science of refrigeration.**

- 1.1. Define refrigeration, refrigerant and refrigerator.
- 1.2. Mention the laws of refrigeration.
- 1.3. Mention the application of refrigeration in our daily life.
- 1.4. Define the heat, temperature & pressure.
- 1.5. Mention the units of heat, temperature and pressure.
- 1.6. Describe the methods of heat transfer in the field of refrigeration.

**2. Understand different methods of refrigeration.**

- 2.1. List different methods of refrigeration.
- 2.2. Identify the refrigeration systems used in automobile air-conditioning.
- 2.3. Mention the principle of evaporative refrigeration.
- 2.4. Describe operation of vapor compression refrigeration system.

**3. Understand the features of vapor compression system components.**

- 3.1. Mention the function of compressor, condenser, expansion device and evaporator.
- 3.2. Mention the classification of compressors, condensers, expansion valves and evaporators used in automobile air conditioner
- 3.3. State the cycling and non cycling compressor.

- 3.4. Describe the operation of swash-plate compressors, scotch yoke compressors and scroll compressors.
- 3.5. Mention the advantages and disadvantages of different types of compressors used in automobile air conditioner.
- 3.6. Mention the advantages & disadvantages of plate, fin type, serpentine type and drawn cup type evaporators.
- 3.7. Describe the operation of thermostatic expansion valve, H-type expansion valve and orifice (expansion tube) used in automobile air conditioner.

**4. Understand the features of the accessories used in auto air-conditioner refrigeration cycle.**

- 4.1. List the accessories used in auto air-conditioner refrigeration cycle.
- 4.2. Mention the function of accessories used in automobile air-conditioner refrigeration cycle.
- 4.3. Describe the operation of receiver, dryer, sight glass and fusible plug.
- 4.4. Describe the operation of low side accumulator.
- 4.5. Mention the purpose of refrigeration lines used in automobile air conditioner application.
- 4.6. Explain the design features of refrigeration lines.
- 4.7. Identify the fittings used in refrigerant lines.

**5. Understand the application of refrigerants.**

- 5.1. Define refrigerant
- 5.2. Mention the classification of refrigerants
- 5.3. List the refrigerant of CFCs, HCFCs and HFCs groups.
- 5.4. State the desirable properties of an ideal refrigerant.
- 5.5. Identify the refrigerants by number.
- 5.6. List the applications of common refrigerants.
- 5.7. Mention the properties of most commonly used refrigerant viz. R-12 ,R-134a & R- 1234 YF
- 5.8. Describe the refrigerant cylinder handling.
- 5.9. Identify the color codes of refrigerant cylinder.
- 5.10. Mention the properties of refrigerant oil used with R-12 R –134a & R- 1234 YF system.

**6. Understand the features of automobile air-conditioning system.**

- 6.1. Define air conditioning system
- 6.2. State the purpose of auto air-conditioning.
- 6.3. Identify the components of automobile air-conditioning system.
- 6.4. Describe the operation of automobile air-conditioning system (cooling and heating).
- 6.5. Describe the ducting system of automobile air-conditioning system.
- 6.6. Describe the air distribution system of a car air conditioner (including ventilation system).
- 6.7. Describe the automotive vehicle body insulation system.
- 6.8. Describe the filtering system of automobile air-condition system.

**7. Understand the features of automobile air-conditioner control system.**

- 7.1. Identify the control panel switches and levers of automobile air-conditioner (heating and cooling system).
- 7.2. Describe the operation of control panel unit with sketch (heating and cooling)
- 7.3. Describe the anti icing control system of automobile air conditioner.
- 7.4. Draw the electric wiring diagram of auto air-conditioner including all safety and control devices.
- 7.5. Describe the construction & operation of manual control systems (including HVAC controller) of automotive air-conditioning system.

7.6. Describe the construction & operation of automatic control systems (including HVAC controller) of automotive air-conditioning system.

**8. Understand the features of coupling & safety devices of automobile air-conditioner.**

8.1. Mention the purpose of magnetic clutch.

8.2. Mention the classification of magnetic clutch.

8.3. Describe the construction & operation of magnetic clutch.

8.4. Identify the safety devices used in cycling compressors automobile air-conditioning systems.

8.5. Mention the function of various safety devices in automobile air conditioner.

**9. Understand the concept of transport refrigeration.**

9.1. Define transport refrigeration

9.2. Outline the importance of transport refrigeration

9.3. Mention the field of application of transport refrigeration.

9.4. List various non-mechanical transport refrigeration systems.

9.5. List various mechanical transport refrigeration

9.6. Mention the advantages and disadvantages of non-mechanical transport refrigeration system.

9.7. Mention the advantages and disadvantages of mechanical transport refrigeration system.

**10. Understand features of refrigerated Covered Van and trailers.**

10.1. Identify the various refrigeration system used in covered Van and trailers.

10.2. Describe the body insulation process of refrigerated Covered Van and trailers.

10.3. Describe the product sub-cooling in Covered Van refrigeration system.

10.4. Describe the operation of expendable refrigerant refrigeration system.

10.5. Describe the operation of eutectic solution in Covered Van refrigeration system.

10.6. Describe the servicing procedure of a conventional Covered Van refrigeration system.

**11. Understand the concept of bus air-conditioning system.**

11.1. Describe the dual compressor refrigeration cycle of a bus air-conditioning system.

11.2. Describe the different components of bus air conditioner refrigeration cycle.

11.3. Mention possible locations on bus air conditioner.

11.4. Describe air distribution systems of bus air-conditioner.

11.5. Describe the control system of bus air-conditioning system.

11.6. Identify the electric circuit of bus air-conditioning system.

11.7. Mention typical specification of bus air-conditioner.

**12. Understand the automobile air-conditioning system servicing.**

12.1. Identify the equipment and tools used in automobile air-conditioning servicing works.

12.2. Mention the cautions for air-conditioner service and special cautions for refrigerant 134a system.

12.3. List the various contaminants of air-conditioner.

12.4. Mention the effects of various contaminants of air-conditioner.

12.5. Describe the refrigerant system quick check and air-conditioner visual inspection.

12.6. Mention the sight glass indication for various conditions in the refrigeration system.

12.7. Describe the leak detection methods of automobile air-conditioning system.

12.8. Mention the evacuation, refrigerant charging and oil adding procedure of automobile air-conditioner unit.

12.9. Mention the performance test procedure of automobile air-conditioner.

12.10. Mention the fault diagnosis and remedies of automobile air-conditioner.

## **PRACTICAL:**

### **1. Identify the equipment & tools and materials used in basic refrigeration and automobile air-conditioning works.**

- 1.1 Identify the hand tools used in refrigeration & automobile air-conditioning works.
- 1.2 Identify the power tools/equipment used in refrigeration & automobile air-conditioning works.
- 1.3 Identify the materials used in refrigeration & automobile air-conditioning works.
- 1.4 Demonstrate the measures should be taken during the use of tools & equipment of auto air-conditioning.

### **2. Perform the tube cutting, bending and swaging of copper tube.**

- 2.1 Select proper copper tube & tools.
- 2.2 Practice tube cutting.
- 2.3 Practice tube bending in different angle.
- 2.4 Practice tube swaging.

### **3. Perform the soldering and brazing of refrigeration & auto air-conditioning work.**

- 3.1 Select proper tools & materials for soldering work.
- 3.2 Practice soldering in correct method.
- 3.3 Select proper tools & materials for brazing work.
- 3.4 Practice brazing in correct method.

### **4. Isolate the compressor from the system.**

- 4.1 Recover gas from the system.
- 4.2 Disconnect the electrical line.
- 4.3 Disconnect inlet & outlet connection.
- 4.4 Remove mounting nut/bolt.
- 4.5 Isolate the compressor from the system.

### **5. Remove and replace clutch pulley bearing.**

- 5.1 Disconnect clutch pulley belt.
- 5.2 Remove clutch centre bolt & snapping.
- 5.3 Remove clutch pulley with bearing.
- 5.4 Remove bearing from the pulley.
- 5.5 During replacing follow the reverse process of removing.

### **6. Perform servicing the magnetic clutch.**

- 6.1 Remove magnetic clutch from vehicle.
- 6.2 Disassemble the clutch and clean each component.
- 6.3 Inspect each component for workability.
- 6.4 Change or repair if necessary.

### **7. Replace the refrigerant hose & filter.**

- 7.1 Recover refrigerant.
- 7.2 Remove deactivate hose/filter.
- 7.3 Replace new/filter.
- 7.4 Evacuate the system.
- 7.5 Charge refrigerant in the system.

**8. Evacuate the automobile air-conditioning system and charge refrigerant in the system.**

8.1 Connect hose pipe, gauge & vacuum pump properly with charging port.

8.2 Evacuate properly.

8.3 Set gas cylinder properly.

8.4 Charge gas as per requirement.

**9. Test the leaks in the automobile air-conditioning system.**

9.1 Collect a leak detector

9.2 Place the sniffer of leak detector to possible leakage places.

9.3 Find out place of leakage.

**10. Purge the air-conditioning system.**

10.1 Disconnect inlet and outlet line from compressor.

10.2 Supply dry Nitrogen gas ( $N_2$ ) through discharge side.

10.3 Connect discharge line and suction line to the compressor.

10.4 Last of all evacuate the whole system.

**11. Test and adjust the thermostatic expansion valve.**

11.1 Test the thermostatic expansion valve.

11.2 Adjust the thermostatic expansion valve by adjusting screw.

**REFERENCE BOOKS**

1. Modern Refrigeration and Air-conditioning – Althouse/Turnquist/ Bracciano.
2. Basic Refrigeration and Air-conditioning – Hazr & Chakravarty.
3. Automobile Mechanics – Crouse – Anglin.

**AIMS**

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automobile engine overhauling and inspection with special emphasis on:

- engine removal process from chassis
- engine top overhauling
- major overhauling
- inspection and maintenance of all engine components

**SHORT DESCRIPTION**

Features of overhauling and inspection; Test required for overhauling; Process of engine removal and cleaning; Process of engine top overhauling; Overhauling of cylinder, piston & connecting rod assembly; Overhauling of cam shaft, crankshaft and timing gear assembly; Feature of gasket; Lubricating system overhauling, Cooling system overhauling; Fuel system overhauling; Ignition system overhauling, Engine conversion.

**DETAIL DESCRIPTION****Theory:****1. Understand the features of overhauling and inspection.**

- 1.1 Define the terms overhauling and inspection.
- 1.2 Identify the types of overhauling.
- 1.3 List the symptoms of overhauling.
- 1.4 Outline the importance of inspection.
- 1.5 Identify the types of inspection.
- 1.6 Mention the causes of top, minor & major overhauling.
- 1.7 Distinguish the top, minor & major overhauling.
- 1.8 Mention the steps of overhauling.

**2. Understand the test required for overhauling.**

- 2.1 Describe the procedure of cylinder compression test.
- 2.2 Describe the procedure of cylinder leakage test.
- 2.3 Describe the procedure of engine vacuum test.

**3. Understand the process of engine removal and cleaning.**

- 3.1 Mention the steps of preparation for engine removing.
- 3.2 Describe the procedure of engine removing from chassis.
- 3.3 List the steps of precaution during engine removal from chassis.
- 3.4 Describe the methods of cleaning engine parts by steam, kerosene, gasoline, compressed air and various cleaning agents.

**4. Understand the process of engine top overhauling.**

- 4.1 Describe procedure of removing cylinder head from engine block.
- 4.2 Describe removal of valves and rocker arm mechanism.
- 4.3 Describe the procedure of de-carbonizing.
- 4.4 Describe the inspection procedure of cylinder head and valve guides.
- 4.5 Describe the removing and replacing of an engine valve guide.

- 4.6 Describe the procedure of inspection, testing & replacing a valve springs.
- 4.7 Describe the procedure of replacing valve seat insert and installing new inserts.
- 4.8 Describe procedure of adjusting tappet clearance of I-head, L-head, T-head and F-head engine.
- 4.9 Describe the procedure of inspecting hydraulic valve lifter.

**5. Understand overhauling of cylinder, piston & connecting rod assembly.**

- 5.1 Describe the procedure for removal of oil pan assembly.
- 5.2 Describe the procedure of removing cylinder ridge.
- 5.3 Describe the procedure of removing and inspection a piston and connecting rod assembly.
- 5.4 Describe the procedure of measuring of used engine cylinder for determining taper and out of round wear.
- 5.5 Describe the procedure for replacing connecting rod and piston assembly.
- 5.6 Describe the procedure for inspecting bearing clearance and adjusting connecting rod bearing in various methods.
- 5.7 Describe the procedure of connecting rod alignment.

**6. Understand the overhauling of cam shafts, crank shaft and timing gear assembly.**

- 6.1 Describe the procedure of removing cam shaft and inspect cam shaft bearings.
- 6.2 Describe the checking procedure of timing gear backlash.
- 6.3 Describe the procedure of installing timing chain.
- 6.4 Describe the procedure of replacing and setting a timing gear.
- 6.5 Describe the procedure of checking valve timing of In-Line engine without dismantling the engine.
- 6.6 Describe the testing procedure of crank shaft.
- 6.7 Describe the inspection of a worn bearing.
- 6.8 Describe the procedure of checking a cylinder head and block for fine crack.

**7. Understand the features of gasket.**

- 7.1 Mention the uses of gasket in an automobile.
- 7.2 Identify the types of gasket used in automobile.
- 7.3 Name the materials used in gasket making.
- 7.4 Describe preparation of a gasket.

**8. Understand the features of lubricating system overhauling.**

- 8.1 Describe replacing procedure of oil filter.
- 8.2 Describe the procedure of overhauling lube-oil pump-gear type, rotor type and plunger type.
- 8.3 Describe the precaution of overhauling a lube oil pump.

**9. Understand the features of cooling system overhauling.**

- 9.1 Describe the procedure of inspecting and adjusting fan belt.
- 9.2 Describe the removing and testing thermostat.
- 9.3 Describe the inspection procedure of leakage in the cooling system.
- 9.4 Describe the procedure of overhauling water pump.
- 9.5 Describe the procedure of checking and replacing radiator pressure cap.
- 9.6 Describe the process of cleaning radiator and water jacket.

**10. Understand the features of fuel system overhauling.**

- 10.1 Describe the procedure of disassembling and reassembling conventional carburetor and complex type carburetor to find out faults with remedies.
- 10.2 Describe the test procedure of pressure and vacuum of gasoline fuel pump.

- 10.3 Describe the procedure of disassembling and reassembling of in-line type high pressure fuel pump and find out the faults with remedies.
- 10.4 Describe the procedure of disassembling and reassembling of distributor type high pressure fuel pump.
- 10.5 Describe the procedure of disassembling and reassembling of unit injector type high pressure fuel pump.
- 10.6 Describe the phasing and calibration of high pressure pump.
- 10.7 Describe the procedure of disassembling and reassembling of injector and find out the faults with injector tester.
- 10.8 Describe the testing procedure of EFI injector.

#### **11. Understand ignition system overhauling.**

- 11.1 Describe the disassembling, inspecting and assembling of ignition system.
- 11.2 Describe the procedure of checking the ignition system components.
- 11.3 Describe the procedure of checking ignition system by automotive scanner.
- 11.4 Explain the test for missing cylinder.

#### **12. Understand the Concept of Engine Conversion**

- 12.1 Define the objectives of engine conversion.
- 12.2 List the name of components required for conversion.
- 12.3 Describe the functions of each components required for conversion.
- 12.4 Describe the operation of conversion system with block diagram.

### **PRACTICAL:**

#### **1. Remove engine from chassis.**

- 1.1 Disconnect the all external connections to the engine.
- 1.2 Drain out the coolant and lubricants of the engine.
- 1.3 Remove all external accessories of the engine.
- 1.4 Remove engine from the chassis with the help of hydraulic floor jack or portable crane.
- 1.5 Clean the engine by steam cleaner or by any other cleaner.

#### **2. Perform top overhauling.**

- 2.1 Remove cylinder head cover or tappet cover.
- 2.2 Measure the tightening torque of head bolts.
- 2.3 Remove the head bolts as per prescribed rule or sequence and remove the cylinder head.
- 2.4 Disassemble the components of cylinder head and clean them.
- 2.5 Inspect cylinder head and other components viz: valve, valve spring, valve guide, rocker arm, rocker arm shaft, etc. for their work ability.
- 2.6 Assemble the components of cylinder head and keep it in safe side.
- 2.7 Follow safe and systematic procedure of overhauling.

#### **3. Remove the oil pan and accessories.**

- 3.1 Remove the oil pan and keep the bolts in it.
- 3.2 Remove oil pump with strainer.
- 3.3 Remove timing chain / gear cover and other accessories.

#### **4. Remove the piston and connecting rod assembly.**

- 4.1 Inspect ring ridge of cylinder.
- 4.2 Remove cylinder ring ridge (if any) by a ridge remover.

- 4.3 Measure the tightening torque of big end bearing cap and mark the piston.
- 4.4 Loosen the nut bolt of connecting rod and remove bearing cap with bearing.
- 4.5 Remove the piston assembly from crankshaft.
- 4.6 Dismantle the piston, connecting rod and piston rings.
- 4.7 Clean and inspect them for their work ability.
- 4.8 Follow safe and systematic procedure.

**5. Remove and inspect the crankshaft assembly.**

- 5.1 Remove fly wheel.
- 5.2 Remove timing chain or gear cover.
- 5.3 Measure the tightening torque of main journal bearing cap and remove the bearing caps with marking.
- 5.4 Remove the crankshaft.
- 5.5 Clean and inspect the work ability of crankshaft.
- 5.6 Measure taper and out of round of crank shaft.
- 5.7 Follow safe and systematic procedure.

**6. Remove and inspect the camshaft and bearing assembly.**

- 6.1 Remove camshaft.
- 6.2 Remove camshaft bearing.
- 6.3 Clean and inspect camshaft and camshaft bearing for their work ability.
- 6.4 Follow safe and systematic procedure.

**7. Perform inspection of cylinder and cylinder blocks.**

- 7.1 Inspect cylinder bore of taper and out round wear.
- 7.2 Inspect cylinder bore for glazing and other condition.
- 7.3 Inspect cylinder block for fine crack.
- 7.4 Remove and replace cylinder liner.
- 7.5 Follow safe and systematic procedure.

**8. Perform servicing lubricating system overhauling.**

- 8.1 Disassemble lube oil pump and check side clearance, teeth clearances, end clearance and compare the reading with manufacturers wear limit.
- 8.2 Assemble lube oil pump.
- 8.3 Remove and replace oil filter.
- 8.4 Adjust oil pressure.
- 8.5 Clean the oil strainer and fit it with pump.

**9. Perform the servicing of cooling system overhauling.**

- 9.1 Test a thermostat of cooling system.
- 9.2 Flush the engine water jacket and radiator.
- 9.3 Remove water pump, dismantle and examine all parts for crank and wear.
- 9.4 Test the leakage of cooling system by using a pressure tester.

**10. Perform petrol fuel system overhauling.**

- 10.1 Check delivery pressure and discharge rate of gasoline fuel pump.
- 10.2 Overhaul a carburetor and replace the defective parts and gasket.
- 10.3 Test the injector pattern and quantity of injected fuel by EFI tester

**11. Perform Diesel fuel system overhauling.**

- 11.1 Test phasing and calibration of high pressure fuel pump.

11.2 Test the injector pattern of fuel by injector tester.

**12. Perform ignition system overhauling.**

12.1 Align CB point and adjust the gap.

12.2 Clean spark plugs and adjust gap.

12.3 Set the ignition timing and test with ignition timing gun.

12.4 Test primary circuit for short circuit and high resistance.

**13. Perform assembling of complete engine.**

13.1 Assemble the engine step by step.

13.2 Follow safe and systematic procedure.

**14. Perform the installation of engine on chassis.**

14.1 Re-install the engine with proper tools and equipment.

14.2 Refit all external accessories of the engine.

14.3 Connect all electrical and mechanical linkage.

**REFERENCE BOOKS**

1. Automobile Machine - Crouse & Alinger.
2. Automobile Engine Overhauling - A. W. Judge.
3. Automobile Engine Maintenance & Repair - Venk and Billet.
4. Automotive Fundamentals - F. Nash

**AIMS:**

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of fuels and lubricants with special emphasis on:

- Solid fuel
- Gaseous fuel
- LPG, LNG and CNG fuels
- Crude oil and crude oil refining
- Gasoline, diesel, kerosene, alternative fuels and fuel oil
- Solid, semi-solid and liquid lubricants

**SHORT DESCRIPTION**

Concept of fuels; Solid fuels; Analysis of coal; Gaseous fuels; LPG fuels; LNG fuel and CNG fuel; Crude oil; Hydrocarbon; Refining of crude petroleum; Gasoline fuel; Test and additives of gasoline; Diesel fuel; Solid lubricants; Grease; Lubricating oil.

**DETAIL DESCRIPTION****Theory:****1. Understand the basic concept of fuels.**

- 1.1 State the meaning of fuel.
- 1.2 Mention the modern concept of fuels.
- 1.3 Mention the classification of fuels.
- 1.4 State the meaning of fossil fuels.
- 1.5 Mention the alternatives of fossil fuels.
- 1.6 State the meaning of solid fuels.
- 1.7 Mention the properties of solid fuels.
- 1.8 Mention the composition and properties of natural solid fuels.
- 1.9 Compare among of solid, liquid and gaseous fuel.

**2. Understand the aspect of coal.**

- 2.1 Describe the formation of coal.
- 2.2 Mention the classification of coal.
- 2.3 Explain the properties of coal.
- 2.4 Explain the role of sulphur and ash in coal.
- 2.5 Describe sources of coal in Bangladesh.
- 2.6 Explain higher calorific value (HCV) and lower calorific value (LCV).
- 2.7 Mention the Dulong's formula and Davies formula to determine calorific value of coal.
- 2.8 Describe the procedure of determination of heating value by bomb Junkers gas calorimeters.

**3. Understand the concept of gaseous fuels.**

- 3.1 State the meaning of gaseous fuels.
- 3.2 Mention the classification of gaseous fuels.
- 3.3 Mention the composition of different gaseous fuels.
- 3.4 Mention the advantages and disadvantages of gaseous fuels.
- 3.5 Describe storing and handling procedure of gaseous fuels.
- 3.6 Describe the heating value determination procedures of gaseous fuel.
- 3.7 Mention the present scenario of natural gas in Bangladesh.

**4. Understand the concept of Alternative fuel.**

- 4.1 Define Alternative fuel.
- 4.2 Describe the importance of alternative fuel.
- 4.3 Mention the Alternative fuels used in SI & CI engines.
- 4.4 Mention the alternative energy sources.

- 4.5 Explain the composition different alternative fuels.
- 4.6 Mention the advantages & disadvantages of alternative fuel

**5. Understand the concept of CNG, LNG and LPG fuel.**

- 5.1 State the meaning of CNG, LNG and LPG fuel.
- 5.2 Mention the composition of CNG, LNG and LPG fuel.
- 5.3 Mention the characteristic of CNG, LNG and LPG fuel.
- 5.4 State the static condition pressure and filling condition pressure in Bar of a CNG, LNG and LPG fuel station.
- 5.5 Describe storage and handling procedure of CNG, LNG and LPG fuel.
- 5.6 Mention the uses of CNG, LNG and LPG fuel.
- 5.7 Compare among CNG, LNG and LPG fuel
- 5.8 Explain of safety aspects of CNG, LNG and LPG fuel.

**6. Understand the concept of crude petroleum/ oil.**

- 6.1 State the meaning of crude petroleum/oil.
- 6.2 Mention the classification of crude petroleum/oil.
- 6.3 Mention the composition of crude oil.
- 6.4 Describe the origin of crude petroleum/oil.
- 6.5 Describe the region of various oil field of the world.
- 6.6 Describe the determination procedure of crude petroleum/oil reserve.

**7. Understand the concept of hydrocarbon family and refining of crude petroleum/ oil.**

- 7.1 Mention the types of hydrocarbon classification of hydrocarbon family.
- 7.2 Explain the properties of different types of hydrocarbon.
- 7.3 State the purpose of crude oil refining.
- 7.4 Mention the classification of the various treatments performs on the crude oil to obtain the desired product.
- 7.5 Describe the separation process of distillation, absorption, adsorption, filtration, solvent extraction.
- 7.6 Describe the most common methods of break down processes.
- 7.7 Describe the rebuilding processes of reforming, alkylation, isomerization, and polymerization.
- 7.8 Describe the purification process of petroleum product.
- 7.9 Explain the refining process with flow chart.

**8. Understand the concept of gasoline fuel.**

- 8.1 State the meaning of gasoline fuel.
- 8.2 Mention the uses of gasoline fuel.
- 8.3 Describe the characteristics of gasoline fuel.
- 8.4 Mention the specification of gasoline fuel.
- 8.5 Describe the blending of gasoline.
- 8.6 Describe the treatment procedure of gasoline fuel.
- 8.7 Explain volatility of gasoline fuel and its effect on the engine.
- 8.8 Explain the effect of gasoline fuel on the engine performance.
- 8.9 Explain the abnormal combustion phenomena of gasoline fuel.

**9. Understand the concept of test and additives of gasoline fuel.**

- 9.1 Describe the distillation test of gasoline fuel.
- 9.2 Describe the reid vapor pressure test procedure of gasoline.
- 9.3 Describe the procedure of equilibrium air distillation test.
- 9.4 State the meaning of octane number.
- 9.5 Describe the octane number determination procedure with CRF engine and knock meter.
- 9.6 Mention the knock ratings methods.
- 9.7 Describe the octane ratings methods.
- 9.8 State the meaning of anti knock agents.
- 9.9 Mention the additives used in gasoline.

**10. Understand the concept of diesel fuel.**

- 10.1 State the meaning of diesel fuel.
- 10.2 Explain important characteristics of diesel fuel.
- 10.3 Mention the specification for diesel fuel.
- 10.4 Describe the distillate and residual fuel used for diesel engine.

- 10.5 State the significance of cetane number.
- 10.6 Describe the cetane number determination procedure of diesel fuel.
- 10.7 Explain the significance of diesel fuel viscosity on the engine performance.
- 10.8 Describe the flash point and fire point determination procedure of diesel fuel.
- 10.9 Mention the composition, purification and properties of kerosene.

**11. Understand the concept of kerosene fuel.**

- 11.1 Mention the uses of kerosene.
- 11.2 Mention the composition of kerosene.
- 11.3 Explain the properties of kerosene.
- 11.4 Mention the specifications of kerosene.
- 11.5 Explain the purification process of kerosene.

**12. Understand the concept of lubricants.**

- 12.1 Define lubricants.
- 12.2 Mention the different types of lubricants.
- 12.3 List the most common solid lubricants.
- 12.4 Mention the field of application of solid lubricants.
- 12.5 Mention the classification of grease.
- 12.6 Explain the properties of grease.
- 12.7 Explain the constituents of grease.
- 12.8 Explain the grease additives.
- 12.9 Describe manufacturing process of grease.
- 12.10 Mention the advantages and disadvantages of grease over solid and liquid lubricants.

**13. Understand the concept of lubricating oil.**

- 13.1 State the purpose of lubricating oil in the engine.
- 13.2 Mention the classification of lubricating oil.
- 13.3 Explain the various properties of lubricating oil.
- 13.4 Mention the various additives used in lubricating oil.
- 13.5 Mention the significance of viscosity index.
- 13.6 Explain the viscosity rating and service rating of lubricating oil.
- 13.7 State the meaning of synthetic lubricating oil.
- 13.8 Name some synthetic lubricating oil.

**PRACTICAL:**

**1. Demonstrate the different types of fuels and lubricants.**

- 1.1 Identify various types of solid fuels.
- 1.2 Identify various types of liquid fuel.
- 1.3 Identify various types of solid lubricants.
- 1.4 Identify various types of semi solid lubricants.
- 1.5 Identify various types of liquid lubricants.

**2. Show the petroleum refinery flow chart.**

- 2.1 Draw the schematic diagram of a typical modern petroleum refinery showing main units and products.
- 2.2 Draw a simplified flow diagram for automated refinery showing main quality analysis for process units and blending areas.

**3. Analyze the composition of coal.**

- 3.1 Determine the percentage of moisture, ash, volatile matter and fixed carbon of a sample coal by proximate analysis.
- 3.2 Determine the percentage of carbon, hydrogen, nitrogen, sulphur, oxygen and ash of a sample coal by ultimate analysis.

**4. Determine the heating value of fuels.**

- 4.1 Find the heating value of a coal sample by bomb calorimeter.
- 4.2 Find the heating value of a sample of diesel fuel by bomb calorimeter.
- 4.3 Find the heating value of a natural gas by continuous flow Junker's gas calorimeter.

**5. Determine the volatility of fuel.**

- 5.1 Find the volatility of gasoline, naphtha, Kerosene, or similar petroleum product by ASTM distillation test apparatus.
- 5.2 Find the vapor lock tendency of a gasoline by the Reid vapor pressure test.
6. **Determine the viscosity of lubricating oil by a viscometer.**
  7. **Determine the pour point and cloud point of lubricating oil by pour point test apparatus.**
  8. **Determine the octane number of gasoline by CRF research method/Motor method.**
  9. **Determine the cetane number of diesel fuel by the CRF engine.**
  10. **Make a typical soap grease by cold set method.**
  11. **Perform the consistency test of grease by the penetrometer.**
  12. **Determine the drop point of grease by the drop point apparatus.**

**REFERENCE BOOKS:**

1. Fuels and Petroleum Processing - B. K SHARMA
2. Advanced Petroleum Refining - G. N. SARKAR
3. Outlines of Chemical Technology - M. GOPALA RAO MARSHALL SITTIG
4. A Course in Internal Combustion Engine - M. L. Mathur R. P Sharma.
5. Thermal Engineering - P.L. Balancy
6. Thermal Engineering - R.S. Kharmi

**65851**

## **Accounting Theory & Practice**

<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>3</b>	<b>3</b>

### **AIMS**

- To be able to understand the principles and practices of book keeping and accounting.
- To be able to understand the procedures of general accounting, financial accounting and their applications.
- To be able to understand the concept of income tax , VAT & Public works accounts.

### **Course Outlines**

Concept of book keeping and accounting; Transactions; Entry systems; Accounts; Journal; Ledger; Cash book; Trial balance; Final accounts; Cost account & financial accounting; Income Tax; Public works accounts.

### **DESCRIPTION;**

#### **Theory**

#### **1. Concept of book keeping and accounting.**

- 1.1 Define book keeping and accountancy.
- 1.2 State the objectives & of book keeping.
- 1.3 State the advantages of book keeping.
- 1.4 Differentiate between book keeping and accounting.
- 1.5 State the necessity and scope of book keeping and accounting.

#### **2. Transactions Analysis.**

- 2.1 Define transactions and business transaction.
- 2.2 Describe the characteristics of transaction.
- 2.3 Discuss the classification of transaction.

#### **3. Entry system of Accounting.**

- 3.1 State the aspects of transactions.
- 3.2 Define single & double entry system ..
- 3.3 Discuss the principles of double entry system.
- 3.4 Distinguish between single entry and double entry system of book keeping.
- 3.5 Justify whether double entry system is an improvement over the single entry system.

#### **4. Classification of accounts.**

- 4.1 Define accounts.
- 4.2 State the objectives of accounts.
- 4.3 Illustrate different type of accounts with example.
- 4.4 Define "Golden rules of Book keeping".
- 4.5 State the rules for "Debit" and "Credit" in each class of accounts.
- 4.6 Define accounting cycle.

#### **5. Journal .**

- 5.1 Define Journal.
- 5.2 State the functions of Journal.
- 5.3 Mention the various names of Journal.
- 5.4 Interpret the form of Journal.

## **6. ledger.**

- 6.1 Define ledger.
- 6.2 Interpret the form of ledger.
- 6.3 State the functions of ledger.
- 6.4 Distinguish between Journal and Ledger.
- 6.5 Explain why ledger is called the king of all books of accounts.
- 6.6 Explain the following terms: Balance, Balancing; Debit balance; credit balance.

## **7. Cash book & Its Classification.**

- 7.1 Define cash book.
- 7.2 Classification of cash book.
- 7.3 Explain cash book as both Journal and Ledger.
- 7.4 Define discount.
- 7.5 Explain the different types of discount.

## **8. Trial balance.**

- 8.1 Define trial balance.
- 8.2 State the object of a trial balance.
- 8.3 Discuss the methods of preparation of a trial balance.
- 8.4 Explain the limitations of a trial balance.
- 8.5 Prepare trial balance from given ledger balance (practical)

## **9. Final accounts.**

- 9.1 State the components of final account.
- 9.2 Distinguish between trial balance and balance sheet.
- 9.3 Select the items to be posted in the trading account, profit & loss account and the balance sheet.
- 9.4 State the adjustment to be made from the given information below or above the trial balance.
- 9.5 Explain the following terms: revenue expenditure; capital expenditure; depreciation; annuity method demnishing balance method, machine hour method

## **10. Cost and financial accounting.**

- 10.1 Define financial accounting.
- 10.2 State the objectives of financial accounting.
- 10.3 Define cost accounting.
- 10.4 State the elements of direct cost and indirect cost.
- 10.5 Discuss the capital budgeting
- 10.6 Explain the following terms:
  - a. Fixed cost
  - b. Variable cost
  - c. Factory cost
  - d. Overhead cost
  - e. Process cost
  - f. Direct cost
  - g. Operating cost
  - h. Standard cost

## **11. Income Tax**

- 11.1 Define Income Tax.
- 11.2 State the objects of Income Tax.
- 11.3 Classification of assesses.
- 11.4. Taxable income of assesses.
- 11.5 Tax rebate.
- 11.6 Explain the following terms: Income tax year; assessment year, NBR.

## **12. Public works accounts.**

- 12.1 State the important aspects of public works accounts.

- 12.2 Describe the main features of public works accounts.
- 12.3 Define Value Added Tax (VAT)
- 12.4 State the merits and demerits of VAT.
- 12.5 Explain the following terms :Revenue ; Grant ; Bill; Voucher.

### **PRACTICAL**

1. Identify the transaction from given statements stating reasons.
2. Determine Debtor (Dr) and Creditor (Cr.) from given transactions applying golden rules.
3. Journalize from given transactions.
4. Prepare ledger from given transactions.
5. Prepare double column cash book from given transactions showing balances.
6. Prepare triple column cash book from given transaction and find out the balances.
7. Prepare analytical and imprest system of cash book.
8. Prepare trial balance from the given ledger balance.
9. Prepare trading account, profit & loss account and balance sheet from the given trial balance & other information.
10. Prepare cost sheet showing prime cost, factory cost, cost of production, total cost and selling price.

### **REFERENCE BOOKS**

- |                               |                          |
|-------------------------------|--------------------------|
| 1. Book-keeping & Accounting  | - Prof. Gazi Abdus Salam |
| 2. Principles of Accounting   | - Hafiz uddin            |
| 3. Cost Accounting            | - Prof. Asimuddin Mondol |
| ৪. হিসাবরক্ষণ ও হিসাববিজ্ঞান  | - পরেশ মন্ডল             |
| ৫. উচ্চ মাধ্যমিক হিসাববিজ্ঞান | - হক ও হোসাইন            |
| ৬. আয়কর                      | - ড. মনজুর মোরশেদ        |