

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)

SI. No	Subject Code	Name of the subject	т	Ρ	с	Marks				
						Theory		Practical		Total
						Cont.	Final	Cont.	Final	TOLAI
						assess	exam	assess	exam	
1	66251	Automotive Suspension &	2	6	4	40	60	50	50	200
		Power Transmission System								
2	66252	Automotive Two & Three	2	3	3	40	60	25	25	150
		wheeler								
2	66252	Automobile Air-Conditioning	2	2	2	40	60	25	25	150
5	00233	Automobile All - Conditioning	2	3	5	40	00	25	25	130
4	67153	Engine Overhauling & Inspection	2	6	4	40	60	50	50	200
5	07145		2	5	5	40	00	25	25	130
6	65851	Accounting Theory & Practice	2	З	З	40	60	50	0	150
5	05051	Accounting meory & Fractice	2	5	5	-10		50	0	130
Total			12	24	20	240	360	225	175	1000
iotai				27	20	240	550	225	1/5	1000

5th SEMESTER

66251 Automotive Suspension & Power Transmission System T P C

264

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 gearbox.
- 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.

- 8.11Describe 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 continously variable Transmission(CVT).
- 10.2 Mention the advantage of ECT and CVT system.
- 10.3 Describe the 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 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 leafs 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. Suspenssion, Brake and Power Transmision system Md. Mussadek Hossain

66252 Automotive Two & Three Wheelers

T P C 2 3 3

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.

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.
- 6.5 Describe the operation of clutch, gearbox, differential, propellershaft.
- 6.6 Describe the adjusting Mechanism of clutch.
- 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 of steering system of two wheelers.
- 7.3 Describe the construction 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 of suspension system of two wheelers.
- 8.3 Describe the front suspension system of three wheelers.
- 8.4 Describe the real 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 operation of mechanical brake system used in two wheelers.
- 9.4 Describe the operation of hydraulic brake system of three wheelers.
- 9.5 Describe the operation of master cylinder of three wheelers
- 9.6 Describe the operation of wheel cylinder of three wheelers.
- 9.7 Compare disk and drum type brake used in two wheelers
- 9.8 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 constriction 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.

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 clutch, gear and drive chain mechanism.
- 13.4 Find out the causes and remedies of problems of clutch, gear and drive chain.

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 Lynnr Mosher.

66253 Automobile Air-conditioning T P C

2 3 3

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
- 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 and R –134a 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 manual and 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 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 duel 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 airconditioner 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 airconditioning works.
- 1.1Identify the hand tools used in refrigeration & automobile air-conditioning works.
- 1.2Identify the power tools/equipment used in refrigeration & automobile air-conditioning works.
- 1.3Identify the materials used in refrigeration & automobile air-conditioning works.
- 1.4Demonstrate the measures should be taken during the use of tools & equipment of auto airconditioning.

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

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

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

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

4. Isolate the compressor from the system.

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

5. Remove and replace clutch pulley bearing.

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

6. Perform servicing the magnetic clutch.

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

7. Replace the refrigerant hose & filter.

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

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

- 8.1Connect hose pipe, gauge & vacuum pump properly with charging port.
- 8.2Evacuate properly.
- 8.3Set gas cylinder properly.
- 8.4Chage gas asper requirement.

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

- 9.1Collect aleak ditector
- 9.2Place the sniffer of leak ditector to possible leakage places.
- 9.3Find 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(N₂) through discharge side.
- 10.3 Connect discharge line and suction line to the compressor.
- 10.4 Last of all evacuate the hole 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
- Hazrh & Chakravarty.

- 3. Automobile Mechanics
- Crouse Anglin.

67153 Engine Overhauling & Inspection

T P C 2 6 4

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.
- $10.2\ {\rm Describe}$ 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.
- $10.6\ \mathrm{Describe}$ 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.
- $10.8\ {\rm Describe}$ 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.

 $11.2\ \mbox{Test}$ 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

67143 Fuels & Lubricants трс

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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.

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

2. Understand the aspect of coal.

- 2.1Describe the formation of coal.
- 2.2 Mention the classification of coal.
- 2.3Explain the properties of coal.
- 2.4Explain the role of sulpuer and ash in coal.
- 2.5Describe sources of coal in Bangladesh.
- 2.6Explain higher calorific value (HCV) and lower calorific valve (LCV).
- 2.7 Mention the Dulong's formula and Davies formula to determine calorific value of coal.
- 2.8Describe the procedure of determination of heating value by bomb Junkers gas calorimeters.
- 2.9Solve problems using Dulong's formula and IA Davies formula.

3. Understand the concept of gaseous fuels.

- 3.1State 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.
- 3.5Describe storing and handling procedure of gaseous fuels.

- 3.6Describe the heating value determination procedures of gaseous fuel.
- 3.7 Mention the present scenario of natural gas in Bangladesh.
- 3.8Solve problems relating calorific value of gaseous fuel.

4. Understand the concept of Alternative fuel.

- 4.1Define Alternative fuel.
- 4.2Describe 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.

- 5.1State 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.
- 5.4State the static condition pressure and filling condition pressure in Bar of a CNG, LNG and LPG fuel station.
- 5.5Describe 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
- 5.8Explain of safety aspects of CNG, LNG and LPG fuel.

6. Understand the concept of crude petroleum.

- 6.1State the meaning of crude petroleum.
- 6.2 Mention the classification of crude petroleum.
- 6.3 Mention the composition of crude oil.
- 6.4Describe the origin of crude petroleum.
- 6.5 Describe the region of various oil field of the world.
- 6.6Describe the determination procedure of crude petroleum reserve.
- 6.7Describe the procedure of well drilling.

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

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

8. Understand the concept of gasoline fuel.

- 8.1State the meaning of gasoline fuel.
- 8.2 Mention the uses of gasoline fuel.
- 8.3Describe the characteristics of gasoline fuel.
- 8.4 Mention the specification of gasoline fuel.
- 8.5Describe the blending of gasoline.

- 8.6Describe the treatment procedure of gasoline fuel.
- 8.7Explain volatility of gasoline fuel and its effect on the engine.
- 8.8Explain the effect of gasoline fuel on the engine performance.
- 8.9Explain the abnormal combustion phenomena of gasoline fuel.

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

- 9.1Describe the distillation test of gasoline fuel.
- 9.2Describe the reid vapor pressure test procedure of gasoline.
- 9.3Describe the procedure of equilibrium air distillation test.
- 9.4State the meaning of octane number.
- 9.5Describe the octane number determination procedure with CRF engine and knock meter.
- 9.6 Mention the knock ratings methods.
- 9.7Describe the octane ratings methods.
- 9.8State 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.
- 1.2Identify various types of liquid fuel.
- 1.3Identify various types of solid lubricants.
- 1.4 Identify various types of semi solid lubricants.
- 1.5Identify various types of liquid lubricants.

2. Show the petroleum refinery flow chart.

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

3. Analyze the composition of coal.

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

4. Determine the heating value of fuels.

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

5. Determine the volatility of fuel.

- 5.1Find 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 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
- 7. ফুয়েলস অ্যান্ড লুব্রিক্যান্টস মোঃ রেদওয়ানুর রহমান

65851 Accounting Theory & Practice т р с

2 3 3

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 Tex (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

- Prof. Asimuddin Mondol

- Hafiz uddin

- 2. Principles of Accounting
- 3. Cost Accounting
- 4. হিসাবরক্ষণ ও হিসাববিজ্ঞান
- 5. উচ্চ মাধ্যমিক হিসাববিজ্ঞান
- 6. আয়কর

- পরেশ মণ্ডল - হক ও হোসাইন
 - ড. মনজুর মোরশেদ