

**ELECTRICAL TECHNOLOGY (67)**  
3<sup>rd</sup> Semester

Sl. No	Subject code	Name of the subject	T P C			MARKS				
						Theory		Practical		Total
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1	6731	Electrical Circuit -2	3	3	4	30	120	25	25	200
2	6811	Basic Electronics	2	3	3	20	80	25	25	150
3	6632	Computer Application -2	0	6	2	-	-	50	50	100
4	5931	Mathematics-3	3	3	4	30	120	50	-	200
5	5922	Physic-2	3	3	4	30	120	25	25	200
6	5711	Bangla	2	2	3	20	80	50	-	150
7	5811	Social Science-1	2	0	2	20	80	-	-	100
<b>Total</b>			<b>15</b>	<b>18</b>	<b>22</b>					<b>1100</b>

**ELECTRICAL TECHNOLOGY (67)**  
4<sup>th</sup> semester

Sl. No	Subject code	Name of the subject	T P C			MARKS				
						Theory		Practical		Total
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1	6741	Electrical. Appliances	2	6	4	20	80	50	50	200
2	6742	Elec. Installation, Planning & Estimating	2	6	4	20	80	50	50	200
3	6845	Adv. Electronics	3	3	4	30	120	25	25	200
4	5941	Applied Mathematics	3	3	4	30	120	25	25	200
5	6743	Electrical. Engg. Drg.	0	6	2	0	0	50	50	100
6	5841	Business Management	2	0	2	20	80	0	0	100
7	5821	Social Science-2	2	0	2	20	80	0	0	100
<b>Total</b>			<b>14</b>	<b>24</b>	<b>22</b>					<b>1100</b>

<b>6741</b>	<b>ELECTRICAL APPLIANCES</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>6</b>	<b>4</b>

**AIMS**

- To develop understanding and skill on the construction and operation of electrical appliances based on heating principle.
- To develop understanding and skill on the construction and operation of appliances operated by electric motor.
- To enable to acquire skill/competence in diagnosing/localizing faults and repairing & servicing of electrical appliances.

**SHORT DESCRIPTION**

Electric iron; Electric heater; Microwave oven; Rice cooker; Toaster, Hair drier, electric shaving machine, Kettle Geyser. Electric fan; Rechargeable lamp; Vacuum Cleaner; Blower; Dehumidifier; Blender; Washing machine; Water pump; Refrigerator; Air conditioner; Lift and escalator.

**DETAIL DESCRIPTION**

**Theory :**

**1 Understand the basic principle of electric appliances.**

- 1.1 State the meaning of electric appliances.
- 1.2 List the names of appliances based on heating principles.
- 1.3 List the names of the appliances operated by electric motor.
- 1.4 State the related codes of electric heating appliances.

**2 Understand the working principle of electric iron.**

- 2.1 Name different types of electric irons.
- 2.2 Differentiate between an ordinary and an automatic electric iron.
- 2.3 Identify different parts of an electric iron.
- 2.4 Sketch the circuit diagram of an electric iron.
- 2.5 Explain the operating principles of an electric iron.
- 2.6 Explain the operation of thermostat in an automatic electric iron.
- 2.7 Explain the construction and operation of a steam iron.
- 2.8 List the possible faults and their causes and remedies of an electric iron.

**3 Understand the working principle of electric heater.**

- 3.1 List different types of electric heater.
- 3.2 List different parts of a room heater, surface heater and water heater.
- 3.3 Explain the function of heat reflector and guard wire in a room heater.
- 3.4 List the possible faults and their causes and remedies of an electric heater.

**4 Understand the working principle of microwave oven.**

- 4.1 Describe the function of a microwave oven.
- 4.2 List the main parts of a microwave oven.
- 4.3 List different parts of heat control and timer in an oven.
- 4.4 Describe the function of heat control and timer in an oven.
- 4.5 Sketch the electrical circuit diagram of a microwave oven.

- 4.6 List the possible faults and their causes and remedies of a microwave oven.
- 5 Understand the working principle of rice cooker.**
- 5.1 Describe the function of a rice cooker.
  - 5.2 List the main parts of a rice cooker.
  - 5.3 Explain the function of different parts of a rice cooker.
  - 5.4 List the possible faults and their causes and remedies of a rice cooker.
- 6 Understand the working principle of Electric Toaster.**
- 6.1 List different types of Electric Toaster.
  - 6.2 List different Parts of Electric Toaster.
  - 6.3 Explain the function of different parts of Electric toaster.
  - 6.4 List the possible faults and their Causes and remedies of a electric toaster.
- 7 Understand the features of Hair drier**
- 7.1 State Principle operation of Hair drier.
  - 7.2 List different parts of Hair drier.
  - 7.3 Explain the function of different parts of Hair drier.
  - 7.4 List the possible faults and their causes and remedies of a Hair drier.
- 8 Understand the features of Electric Shaving machine (shaver)**
- 8.1 State principle operation of electric shaving machine.
  - 8.2 List different parts of shaving machine.
  - 8.3 Explain the function of different parts shaving marching.
  - 8.4 List the possible faults and their causes and remedies of a electric shaving machine.
- 9 Understand the features of Electric Kettle.**
- 9.1 State Principle operation of Electric Kettle.
  - 9.2 List deferent parts of electric Kettle.
  - 9.3 Explain the function of different pants of electric Kettle.
  - 9.4 List the possible faults and their causes and remedies of a electric kettle.
- 10 Understand the features of Geysers.**
- 10.1 List the different parts of Geysers.
  - 10.2 Explain the operation of Geysers.
  - 10.3 Discuss the safety precaution of Geysers.
  - 10.4 List of possible faults and causes and their remedies of a Geysers.

- 11 Understand the working principle of table fan/pedestal fan.**
- 11.1 Describe the function of a table fan/pedestal fan.
  - 11.2 List different parts of a table fan/pedestal fan.
  - 11.3 Sketch the circuit diagram of a table fan/pedestal fan.
  - 11.4 Explain the oscillatory mechanism of a table fan/pedestal fan.
  - 11.5 List various components of an electronic fan regulator.
  - 11.6 Explain the operation of an electronic fan regulator.
  - 11.7 List the possible faults and their causes and remedies of a table fan/pedestal fan.
- 12 Understand the features of a rechargeable (emergency) lamp.**
- 12.1 Explain the working principle of a rechargeable lamp.
  - 12.2 Name the different parts of a rechargeable lamp.
  - 12.3 Sketch the circuit diagram of a rechargeable lamp.
  - 12.4 Explain the principle of operation of a rechargeable DC fan.
  - 12.5 List the possible faults and their causes and remedies of a rechargeable lamp.
- 13 Understand the features of a vacuum cleaner.**
- 13.1 Explain the working principle of a vacuum cleaner.
  - 13.2 Name the different parts of a vacuum cleaner.
  - 13.3 Sketch the circuit diagram of a vacuum cleaner.
  - 13.4 List the possible faults and their causes and remedies of a vacuum cleaner.
- 14 Understand the features of an electric blower.**
- 14.1 Explain the working principle of an electric blower.
  - 14.2 Name the different parts of an electric blower.
  - 14.3 Sketch the circuit diagram of an electric blower.
  - 14.4 List the possible faults and their causes and remedies of a electric blower.
- 15 Understand the features of a de-humidifier.**
- 15.1 Explain the principle of operation of a dehumidifier.
  - 15.2 Name different parts and their function of a dehumidifier.
  - 15.3 Sketch the circuit diagram of a de-humidifier.
  - 15.4 List the possible faults and their causes and remedies of a de-humidifier.
- 16 Understand the features of a blender.**
- 16.1 Explain the principle of operation of a blender.
  - 16.2 List the different parts of a blender.
  - 16.3 Sketch the electric circuit of a blender.
  - 16.4 State the function of the timer in a blender.
  - 16.5 List the possible faults and their causes and remedies of a blender.
- 17 Understand the features of a washing machine.**
- 17.1 Explain the principle of operation of a washing machine.
  - 17.2 List the different parts of a washing machine.
  - 17.3 Explain the function of the timer in a washing machine.
  - 17.4 Explain complete washing cycle of a washing machine.

17.5 List the possible troubles and their causes and remedies of a washing machine.

**18 Understand the features of a water pump.**

- 18.1 Explain the principle of operation of a water pump.
- 18.2 State the specification of a water pump.
- 18.3 List different parts with their function.
- 18.4 Sketch the connection diagram of pump motor.
- 18.5 Explain different types of motor starter used in water pump.
- 18.6 List the possible troubles and their causes and remedies of a water pump.
- 18.7 Sketch the circuit diagram of a water level controller.

**19 Understand the features of a refrigerator.**

- 19.1 Explain operating principle of a refrigerator.
- 19.2 Sketch the refrigeration cycle.
- 19.3 Draw the electrical circuit of a refrigerator.
- 19.4 Explain the function of different components of refrigerator.
- 19.5 List the possible faults and their causes and remedies of a refrigerator.

**20 Understand the features of an air conditioner.**

- 20.1 State the principle of operation of an air conditioner.
- 20.2 List different parts of an air conditioner.
- 20.3 Explain the function of filter, ducts and grills, air-conditioning circuit, control, cooling unit and electrical control unit.
- 20.4 Draw the electrical circuit of an air conditioning unit.
- 20.5 List the possible electrical faults and their causes and remedies of an air conditioner.

**21 Understand the features of a lift.**

- 21.1 Explain principle of operation of a lift.
- 21.2 List the different components of a lift.
- 21.3 Mention specification of a common type of lift.
- 21.4 Describe the steps of installation of a lift.
- 21.5 Explain the motor generally used in a lift and its control.
- 21.6 List possible faults and their causes and remedies of a lift.

**22 Understand the features of an escalator.**

- 22.1 Explain principle of operation of an escalator.
- 22.2 State the working principle of escalator.
- 22.3 List the main parts of an escalator.
- 22.4 Name the electric motor generally used in escalator.
- 22.5 Describe the steps of installation of an escalator.

**Practical :**

**1 Perform maintenance and servicing an electric iron.**

- 1.1 Select the equipment and tools necessary for disassembling and servicing an electric iron.
- 1.2 Disassemble the electric iron.
- 1.3 Sketch the different parts of the electric iron.

- 1.4 Observe the heating element and operation of thermostat in the electric iron.
  - 1.5 Diagnose the possible problems in the electric iron.
  - 1.6 Repair or replace the defective parts, if any.
  - 1.7 Reassemble the parts and connect the iron to the power source.
- 2 Perform maintenance and servicing of different types of electric heaters.**
- 2.1 Disassemble the different parts of the electric heater.
  - 2.2 Sketch the main parts of the electric heater.
  - 2.3 Sketch the circuit diagram of a single throw and a double throw thermostatic control electric heater.
  - 2.4 Identify the possible troubles in a heater with causes and remedies.
  - 2.5 Repair or replace the defective parts of the heater, if any.
  - 2.6 Reassemble the parts of the heater.
  - 2.7 Connect the heater to service.
- 3 Perform maintenance and servicing of a microwave oven.**
- 3.1 Disassemble the microwave oven.
  - 3.2 Sketch the main parts of the microwave oven.
  - 3.3 Make a visual study and test the different parts.
  - 3.4 Sketch the electrical circuit diagram of the microwave oven.
  - 3.5 List possible troubles with causes and remedies of a microwave oven.
  - 3.6 Assemble the parts and connect the oven to the power source.
  - 3.7 Observe the operation.
- 4 Perform repair and maintenance of a rice cooker.**
- 4.1 Disassemble the parts of the rice cooker.
  - 4.2 Sketch the main parts of the rice cooker.
  - 4.3 Identify possible troubles with causes and remedies of a rice cooker.
  - 4.4 Assemble the parts of the rice cooker.
  - 4.5 Connect the cooker to the power source.
- 5 Perform the operation and maintenance of a toaster**
- 5.1 Select the necessary tools for disassemble and assemble the components of a toaster.
  - 5.2 Sketch the diagram.
  - 5.3 Connect the toaster to the power source.
  - 5.4 Observe the operation.
- 6 Perform the operation of a Geyser**
- 6.1 Select the necessary tools for disassemble & assemble the components of Geyser
  - 6.2 Sketch the diagram
  - 6.3 Select the different ranges of Geyser.
  - 6.4 Connect the Geyser to the power source.
  - 6.5 Observe the operation.

**7 Perform the operation and maintenance of an Electric Kettle.**

- 7.1 Select the necessary hand tools for disassemble and assemble the electrical components of the electric kettle.
- 7.2 Disassemble and assemble the electric kettle.
- 7.3 Sketch the diagram.
- 7.4 Connect into the power source.
- 7.5 Observe the operation.

**8 Perform repair and maintenance of an oscillatory type fan.**

- 8.1 Disassemble the different parts of the table fan/pedestal fan.
- 8.2 Observe the oscillatory mechanism of the oscillating type of fan.
- 8.3 Sketch the different parts of the fan.
- 8.4 Assemble the fan and connect to the power supply.
- 8.5 Observe the operation.

**9 Perform repair and maintenance of a rechargeable (emergency) lamp.**

- 9.1 Disassemble the rechargeable (emergency) lamp.
- 9.2 Sketch the different parts of the rechargeable lamp.
- 9.3 Test the battery of the lamp.
- 9.4 Check the parts to ensure its sound condition.
- 9.5 Repair and replace the defective parts, if any.
- 9.6 Reassemble the lamp and connect to the power source.
- 9.7 Observe the charging and discharging condition.

**10 Perform repair and maintenance of an electric blower.**

- 10.1 Disassemble the parts of the electric blower.
- 10.2 Sketch the main parts of the electric blower.
- 10.3 Check the parts to ensure the sound condition.
- 10.4 Repair or replace the defective parts, if any.
- 10.5 Reassemble the parts.
- 10.6 Connect the appliances to the power source.
- 10.7 Observe the operation.

**11 Perform repair and maintenance of a vacuum cleaner.**

- 11.1 Disassemble the parts of the vacuum cleaner.
- 11.2 Sketch the main parts of the vacuum cleaner.
- 11.3 Check the parts to ensure the sound condition.
- 11.4 Repair or replace the defective parts, if any.
- 11.5 Reassemble the parts.
- 11.6 Connect the appliances to the power source.
- 11.7 Observe the operation.

**12 Study a dehumidifier.**

- 12.1 Disassemble the dehumidifier.
- 12.2 Sketch the main parts of the dehumidifier.
- 12.3 Identify the major troubles with remedies.
- 12.4 Reassemble the parts.
- 12.5 Connect the dehumidifier to the power supply.
- 12.6 Observe the operation.

- 13 Perform repair and maintenance of a blender.**
  - 13.1 Disassemble the blender.
  - 13.2 Sketch the main parts.
  - 13.3 Identify the major faults generally occurred in a blender.
  - 13.4 Assemble the blender.
  - 13.5 Connect the blender to the power supply.
  - 13.6 Observe the operation.
  
- 14 Perform repair and maintenance of a washing machine.**
  - 14.1 Identify the main parts of the washing machine.
  - 14.2 Sketch the main parts of the washing machine.
  - 14.3 Sketch the electrical circuit of the washing machine.
  - 14.4 Draw the complete washing cycle of washing machine.
  - 14.5 Disassemble the major components.
  - 14.6 Make a visual observation.
  - 14.7 Reassemble the parts.
  - 14.8 Connect the washing machine to the power supply.
  - 14.9 Observe the operation.
  
- 15 Perform repair and maintenance of a water pump.**
  - 15.1 Disassemble the different parts of the water pump.
  - 15.2 Sketch the different parts of the pump and motor.
  - 15.3 Check the insulation resistance of the driving motor.
  - 15.4 Test the continuity and earthing of the driving motor.
  - 15.5 Assemble the pump.
  - 15.6 Observe the operation of pump and method of control against overflow from tank.
  
- 16 Perform repair and maintenance of electrical components of a refrigerator.**
  - 16.1 Identify the different parts of the refrigerator.
  - 16.2 Identify the electrical components of the refrigerator.
  - 16.3 Sketch the wiring circuit showing electrical control system.
  - 16.4 Note down the maintenance procedure of a refrigerator.
  - 16.5 Disassemble and assemble the thermostat control.
  - 16.6 Connect into the power source.
  - 16.7 Observe the operation.
  
- 17 Perform repair and maintenance of electrical components of air-conditioner.**
  - 17.1 List the main parts of the air-conditioner.
  - 17.2 Sketch the main section namely fan with motor, filter, ducts and grill, air conditioning control, cooling unit and electrical control unit.
  - 17.3 Sketch the wiring diagram.
  - 17.4 Disassemble and assemble the electrical components of the air conditioner.
  - 17.5 Connect the air conditioner to the power supply.
  - 17.6 Observe the operation.

**18 Perform operation and maintenance of a lift.**

- 18.1 Visit a nearby establishment where a lift is available.
- 18.2 Note down the different specifications of the lift.
- 18.3 Observe the operating principle of the lift.
- 18.4 Sketch different components of the lift.
- 18.5 Identify the possible troubles and their remedies.

**19 Perform operation and maintenance of an escalator.**

- 19.1 Visit a nearby establishment where an escalator is available.
- 19.2 Note down the different specification of the escalator.
- 19.3 Observe the operating principle.
- 19.4 Sketch the different components of the escalator.
- 19.5 Identify the possible troubles and their causes and remedies of an escalator generally occurred.

**REFERENCE BOOK**

- |   |   |                              |
|---|---|------------------------------|
| 1. Home appliances Service Guide                | – | Edwin P. Anderson.           |
| 2. Study of electrical appliances and devices - |   | K.B Bhatia                   |
| 3. Electrical home appliances service manual -  |   | S. K . Gupta, Gt publication |
| 4. Principle of Refrigeration                   | - | Dossat                       |

<b>6742 ELECTRICAL INSTALLATION, PLANNING AND ESTIMATING</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>2</b>	<b>6</b>	<b>4</b>

### **AIMS**

To provide the student with an opportunity to acquire knowledge, skill and attitude in the area of planning and estimating of electrical installation with special emphasis on:

- Planning and preparation of estimate for an electrical installation.
- Internal wiring and service connection.
- Installation of electrical machines.
- Electricity act / rules and safety practices.

### **SHORT DESCRIPTION**

Planning and estimating; Measurement book, price sheet, catalogue and schedule of labor rate; Illumination; Conductor size and current carrying capacity; Electricity Acts/Rules; Electrical codes; Internal wiring installation; Distribution line; Installation and winding of electrical machine/equipment; Testing electrical installation.

### **DETAIL DESCRIPTION**

#### **Theory:**

#### **PLANNING AND ESTIMATING**

- 1 Understand the concepts of electrical installation.**
  - 1.1 Explain electrical installation.
  - 1.2 List at least three main types of electrical installations.
  - 1.3 Define indoor and outdoor electrical installation.
  - 1.4 Distinguish between indoor and outdoor electrical installation.
  
- 2 Understand the concept of planning of an electrical installation.**
  - 2.1 Define the term planning of an electrical installation.
  - 2.2 Explain the necessity of planning of an electrical installation.
  - 2.3 List at least five main categories of planning of an electrical installation.
  - 2.4 List at least seven factors to be considered for proper planning.
  - 2.5 Calculate the electrical load of residential building, college building, student hostel and office building.
  
- 3 Understand the concept of estimating of an electrical installation.**
  - 3.1 Discuss estimating of an installation.
  - 3.2 Explain the necessity of estimating.
  - 3.3 List at least three important steps for costing of an installation.
  - 3.4 List at least eight steps to be considered for preparing an estimate.

#### **MEASUREMENT BOOK, PRICE SHEET, CATALOGUE AND SCHEDULE OF LABOR RATES**

- 4 Understand the importance of MB writing.**
  - 4.1 Describe MB.
  - 4.2 Explain the necessity of MB.
  - 4.3 Identify the style of maintaining an MB.
  - 4.4 Identify proper specifications for the required materials form catalogue.

- 5 Understand the concept of price sheet and schedule of labor rates.**
- 5.1 Describe price sheet and schedule of labor rates.
  - 5.2 Explain the necessity of price sheet and labor rates for an estimate.
  - 5.3 Prepare a price sheet and a labor rate schedule.

#### **ILLUMINATION**

- 6 Understand the concept of illumination.**
- 6.1 Define illumination.
  - 6.2 Explain at least three laws of illumination.
  - 6.3 Calculate illumination required for different purposes.
  - 6.4 Prepare a chart of illumination for different lamp system (ie including CFL, Incandescent, Florescent )
  - 6.5 Solve problems related to illumination.
  - 6.6 Define the terms Solid angle, Candela, Luminous flux, Luminous intensity, MSCP, MHSCP and different related factors.
- 7 Understand the concept of lighting scheme.**
- 7.1 Discuss direct lighting, indirect lighting, semi-direct and semi-indirect lighting.
  - 7.2 Discuss the level of illumination required for different purposes.
  - 7.3 Discuss at least five factors to be considered for designing a lighting scheme.
  - 7.4 Design a lighting scheme.

#### **CONDUCTOR SIZE AND CURRENT CARRYING CAPACITY**

- 8 Understand the principle of calculating current carrying capacity and determining the conductor size.**
- 8.1 Describe at least three factors to be considered for determining the conductor size.
  - 8.2 Identify the conductor size from the table.
  - 8.3 Calculate the current carrying capacity of a given circuit and the sub circuits.

#### **ELECTRICITY ACTS /RULES**

- 9 Understand the electricity Act/Rules and safety practices.**
- 9.1 List at least ten main electricity rules of Bangladesh Electricity Act.
  - 9.2 Describe the importance of electricity act/rules.
  - 9.3 Explain the need for maintaining safety procedure against electrical hazards.
  - 9.4 Explain at least five of safety measures.

#### **ELECTRICAL CODES**

- 10 Understand the utility of electrical codes.**
- 10.1 List at least ten electrical codes.
  - 10.2 Explain different electrical codes.
  - 10.3 State the advantages of using the electrical codes.

#### **INTERNAL WIRING INSTALLATION**

- 11 Understand the installation of internal wiring.**

- 11.1 Explain internal wiring installation.
- 11.2 Describe at least three main types of internal wiring.
- 11.3 Prepare schedule of materials for batten, channel, surface conduit, and concealed conduit wiring.
- 11.4 Sketch the layout plan for batten, channel, surface conduit, and concealed conduit of small building.
- 11.5 Calculate the load of main circuit and sub circuits.
- 11.6 Select the sizes of wire, main switch, sub-main switches and switches.
- 11.7 Prepare a detail estimate for necessary materials and labor of installation of internal wiring.
- 11.8 Prepare a summary of the estimate.
- 11.9 Prepare an estimate by point method.

**12 Understand the concept of earthing.**

- 12.1 Describe earthing.
- 12.2 Explain the necessity of earthing.
- 12.3 Explain at least three methods of earthing.
- 12.4 Prepare an estimate for earthing.
- 12.5 Explain the method of testing of an earthing installation.
- 12.6 List the desired value of earth resistance for different installations.

**13 Understand wiring layout and schematic diagram of an electrical installation.**

- 13.1 Sketch the layout plan for casing wiring of a small workshop showing lighting loads.
- 13.2 Sketch the layout plan for conduit wiring of a small workshop showing lighting loads.
- 13.3 Sketch the layout plan of casing wiring of the same workshop showing power loads.
- 13.4 Sketch the layout plan of conduit wiring of the same workshop showing power loads.
- 13.5 Sketch the layout plan for service connection showing the required energy meter, DB & SDB.
- 13.6 Sketch the layout plan for earth connection.
- 13.7 Calculate power loads and lighting loads respectively of main circuit and sub-circuits.
- 13.8 Select the sizes of wire, main switch, sub-main switches, switches and distribution boards to lighting and power line respectively.
- 13.9 Prepare an estimate for the required materials and labour from the schedule.
- 13.10 Prepare an estimate for earth connections and earthing.
- 13.11 Prepare a summary of the estimate.

**DISTRIBUTION LINE**

**14 Understand the estimate of LT overhead distribution line.**

- 14.1 Sketch the layout plan of a 400V, 3-phase, 4-wire overhead distribution line with street poles, conductors, insulators and other accessories.
- 14.2 Prepare a schedule of materials required for overhead line.
- 14.3 Prepare an estimate for required materials for one kilometre long overhead LT distribution line with the 5<sup>th</sup> wire for street lighting.
- 14.4 Prepare a schedule of labor for overhead LT distribution line.
- 14.5 Prepare an estimate for overhead LT distribution line.

- 14.6 Prepare a summary of the estimate.

### **INSTALLATION OF ELECTRICAL MACHINE/ EQUIPMENT**

**15 Understand the principle of installation of electrical machine and equipment.**

- 15.1 Sketch the layout plan and single line wiring diagram of a motor connection
- 15.2 Identify the position of motor, main switch, starter and accessories in the diagram.
- 15.3 Calculate the distance of the motor, main switch and starter from the mains.
- 15.4 Determine the sizes of wire, main switch and starter for the installation.
- 15.5 Prepare the material cost.
- 15.6 Estimate labor charge.
- 15.7 Prepare the estimate adding contingencies .

**16 Understand the principle of installation of substation.**

- 16.1 Sketch the layout plan and single line diagram of a substation.
- 16.2 Identify the position of the transformer, circuit breaker, auto re-closer, lightning arrester, isolator and incoming and outgoing bus bar arrangement.
- 16.3 Prepare a schedule of materials required.
- 16.4 Prepare an estimate.

### **TESTING ELECTRICAL INSTALLATION**

**17 Understand the principle of testing of electrical installation.**

- 17.1 Describe at least five main tests to be carried out after completion of wiring of a building.
- 17.2 Describe the tests to be performed after installation of a motor.
- 17.3 Describe the tests to be performed after installation of a transformer.

**18. Apply the principle of winding of electrical machine.**

- 18.1 Sketch the developed diagrams of full pitch and fractional pitch winding of a three-phase induction motor.
- 18.2 Sketch the developed winding diagram of a single phase induction motor.
- 18.3 Estimate the required materials and costs for rewinding of a burnt out induction motor.
- 18.4 Describe the methods of testing winding of electrical machine.

#### **Practical:**

**1 Measure the illumination level of a surface.**

- 1.1 Select the lumen meter.
- 1.2 Measure the illumination level in your wiring lab/ class room.
- 1.3 Compare the obtained reading with the calculated value.

**2 Plan and estimate for electrification of a class room.**

- 2.1 Sketch the layout plan and single line wiring diagram of a class room.
- 2.2 Sketch the wiring and circuit diagram.
- 2.3 Indicate the positions of electrical fittings in the plan.
- 2.4 Find out the sizes of wire and main switch from the calculated load of main circuit and sub-circuits following electricity rules.

- 2.5 Measure the distances of fittings from the main board & BDB and find out the length of the wire.
  - 2.6 List the materials in the schedule and find out the cost.
  - 2.7 Add labor charges from the schedule with material cost for the summary of estimate.
- 3 Plan and estimate for electrification of a single storied residential building.**
- 3.1 Sketch the layout plan of a single storied residential building of about 1250 square feet plinth area in a three katha land with boundary wall and gate showing the position of electric pole for service connection.
  - 3.2 Sketch the wiring and circuit diagrams and show the service connection.
  - 3.3 Show the positions of electrical fittings in the plan.
  - 3.4 Find out the size of wire, main switch, BDB, fuse or MCB from the calculated load of circuit and sub circuit.
  - 3.5 Measure the distance of the fittings from the board to find out the length of wires.
  - 3.6 List the materials in the schedule of materials and find out the cost.
  - 3.7 Add labor charge from the schedule with the material cost for the summary of the estimate.
- 4 Plan and estimate for electrification of a multistoried building.**
- 4.1 Sketch the elevation and floor plan of the building.
  - 4.2 Sketch the wiring and circuit diagrams of a flat.
  - 4.3 Show the positions of the fittings in a flat.
  - 4.4 Find out the size of wires, main switch, fuse or MCB.
  - 4.5 Measure the distance of the fittings from the board to find out the length of wire.
  - 4.6 Identify the rising main and power distribution system.
  - 4.7 Prepare the estimate for electrification of the building.
- 5 Plan and estimate for electrification of an electrical machine shop.**
- 5.1 Sketch the layout plan and single line wiring diagram of the shop.
  - 5.2 Sketch the wiring and circuit diagrams.
  - 5.3 Indicate the positions of the fittings in the plan.
  - 5.4 Find out the size of wires, main switch, fuse or MCB.
  - 5.5 Measure the distance of the fittings from the board to find out the length of wire.
  - 5.6 List the materials in the schedule of materials and find out the cost.
  - 5.7 Add labor charge with the cost of material for the summary of estimate.
- 6 Perform Channel wiring.**
- 6.1 Sketch the layout plan.
  - 6.2 Sketch the wiring and circuit diagrams.
  - 6.3 Indicate the positions of the fittings.
  - 6.4 Find out the size of wire, main switch, fuse/ MCB.
  - 6.5 Measure the distance of the fittings from the main switch.
  - 6.6 Estimate the cost including labour charges.
  - 6.7 Mark the position of the fittings.
  - 6.8 Fix up the rowel plugs on the wall.
  - 6.9 Fix up boards and casing on wall.
  - 6.10 Fasten wires.

- 6.11 Fix up switches and outlets.
- 6.12 Fix up the energy meter, cut-out MCB and main switch.
- 6.13 Connect power supply.
  
- 7 Test an electrical installation (machine/equipment) before commissioning.**
  - 7.1 Select the machine/equipment to be tested.
  - 7.2 Test continuity of the winding of the machine/equipment by AVO meter.
  - 7.3 Test the insulation resistance within the coils by Megger.
  - 7.4 Test the insulation resistance with the coils and body of the machine/equipment by Megger.
  - 7.5 Measure the resistance of the earth point which will be connected to the body of the machine/equipment.
  
- 8 Determine cable size from cable catalogue.**
  - 8.1 Calculate the load of main circuits and sub-circuits of different installations.
  - 8.2 Find out the corresponding suitable cable size from the catalogue allowing safety factor.
  
- 9. Install a single phase/three phase service connection.**
  - 9.1 Sketch the layout plan showing single line service connection from the nearest pole to the service entrance of the building.
  - 9.2 Determine the total electrical load of the installation.
  - 9.3 Measure the distance from the meter at premises to the nearest electric pole.
  - 9.4 Prepare the material cost.
  - 9.5 Add labor charges.
  - 9.6 Add contingencies
  - 9.7 Add lump sum for petty stores like cement, bricks and sand etc.
  - 9.8 Prepare the summary of estimate.
  - 9.9 Procure the materials and hand tools.
  - 9.10 Fix up brackets, service pipe and insulators.
  - 9.11 Draw two GI guard wires with carlings (use draw vice).
  - 9.12 Draw the single core PVC wires through the pipe up to the meter inside the premises.
  - 9.13 Connect one aerial fuse with the phase.
  
- 10 Perform the installation of three phase induction motor.**
  - 10.1 Sketch the layout plan and single line wiring diagram of the motor connection.
  - 10.2 Indicate the position of the motor, main switch and starter.
  - 10.3 Measure the distance of the motor, starter and main switch from the supply main.
  - 10.4 Find out the sizes of wires, main switch and starter.
  - 10.5 Prepare the material cost.
  - 10.6 Add labor charges with the cost of materials for the summary estimate.
  - 10.7 Add contingencies.
  - 10.8 Following electricity rules, connect the mains and operate the motor.
  - 10.9 Install the components and connect to the power source and observe the performance.
  
- 11. Re-wind of a single phase induction motor**
  - 11.1 Calculate the size of conductor, number of coils and number of turns in a coil.

- 11.2 Sketch the develop winding diagram of the induction motor.
- 11.3 Make necessary grouping on the basis of the layout plan for winding.
- 11.4 Find out the types and sizes of wire required for the winding.
- 11.5 Determine the number of turns required on the basis of the coil grouping per phase and layer of winding.
- 11.6 Estimate the cost involved to rewind the motor.
- 11.7 Collect required tools and materials to rewind the motor.
- 11.8 Rewind the motor.
- 11.9 Energize the motor after performing necessary tests.
- 11.10 Measure the RPM of the motor.

**12. Re-wind a three phase induction motor.**

- 12.1 Calculate the number of coils, size of conductor and number of turns in a coil of the motor.
- 12.2 Sketch the developed diagram for winding of the induction motor.
- 12.3 Make necessary grouping of coils.
- 12.4 Find out the types and sizes of wire required for the windings.
- 12.5 Determine the number of turns required on the basis of the coil grouping per phase and layer of winding.
- 12.6 Estimate the cost involved to rewind the motor.
- 12.7 Collect required tools and materials to rewind the motor.
- 12.8 Rewind the motor performing all the steps sequentially.
- 12.9 Energize the motor after performing necessary tests.
- 12.10 Measure the RPM of the motor.

**13. Perform Installation of an earthling.**

- 13.1 Select earth electrode, earth continuity conductor & other necessary materials.
- 13.2 Place the earth electrode into the ground after digging hole.
- 13.3 Put coal & salt into the hole.
- 13.4 Take out the continuity conductor from the earth electrode.

**14. Prepare plan and estimate of a short distribution line.**

- 14.1 Take the measurements of the route of the proposed distribution line.
- 14.2 Sketch the route showing substation, pole and consumer.
- 14.3 Prepare estimate.

**REFERENCE BOOKS**

- 1. Electrical Installation Planning & Estimating  
– J. B. Gupta.
- 2. Electrical Installing Planning and Costing  
– Uppal.

<b>6743</b>	<b>ELECTRICAL ENGINEERING DRAWING</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>6</b>	<b>2</b>

### **AIMS**

- To acquaint with electrical engineering drawings.
- To develop skill in drawing isometric, oblique and orthographic views.
- To enable to interpret and skill to draw thread and fastening devices.
- To develop skill in drawing the symbols for electrical components and equipment.
- To develop skill in drawing the layout diagram of overhead distribution lines.
- To develop skill in drawing the layout diagram of a small sub-station.
- To enable to interpret the electrical layout diagram of a residential building.
- To enable and skill to draw Electrical circuit, plan with ECAD.

### **SHORT DESCRIPTION**

Drawing (elevation, plan and section) of electrical transmission and distribution line structure;

Drawing of symbols used in electrical planning; Drawing of insulator used in overhead line;

Drawing of pole mounted sub-station; Drawing of LT distribution line; Drawing electrical layout and single line wiring diagram of a small residential building; Using ECAD in electrical Drawing and circuit.

### **DETAIL DESCRIPTION**

#### **1 Construct first and third angle orthographic views.**

- 1.1 Understand orthographic projection in first and third angle.
- 1.2 Choose minimum required number of views and complete orthographic Drawing of an object..
- 1.3 Draw three views of an object having hidden features.
- 1.4 Identify and draw the missing view and missing line in a drawing of a engineering object.

#### **2 Draw Isometric Drawing.**

- 2.1 Understand and draw the isometric drawing.
- 2.2 Draw an isometric circle.
- 2.3 Draw oblique views from orthographic views or actual object using isometric scale.
- 2.4 Put dimensions on isometric drawing.

#### **3 Draw Oblique drawing.**

- 3.1 Understand and draw the oblique drawing.
- 3.2 Draw an oblique circle.
- 3.3 Draw oblique views from orthographic views or actual object.
- 3.4 Put dimensions on oblique drawing.

- 4 Prepare the drawing conventions of thread fastening devices.**
- 4.1 Draw the threads showing terminologies.
- 4.2 Draw different types of screw thread profile with correct proportions.
- 4.3 Draw the square/hexagonal headed bolt and nut with proper proportions showing conventional and simplified thread form.
- 5 Prepare the drawings of riveted and welded components.**
- 5.1 Draw the riveted and welded components using conventions and symbols.
- 5.2 Draw a complete set of riveted joint and welded joint.
- 6 Develop the drawing of an electrical distribution line structure.**
- 6.1 Draw the elevation, plan and section of a tubular steel pole used in LT distribution line.
- 6.2 Draw the elevation, plan and section of a concrete pole (RCC/PCC) of the following cross sections.
- Circular
  - I-shaped
  - Rectangular
- 6.3 Draw the elevation plan and section of a wooden pole used in rural electrification.
- 7 Construct the symbols for the equipment, fittings and fixtures commonly used in electrical installations.**
- 7.1 Draw the symbols for the following fittings and fixtures commonly used in electrical installation.
- |                                    |                            |
|------------------------------------|----------------------------|
| • Lamp (incandescent, fluorescent) | • Choke coil               |
| • Lamp outlet                      | • Starter (for tube light) |
| • Ceiling rose                     | • Cartridge fuse           |
| • Socket outlet (2-pin & 3-pin)    | • Power outlet             |
| • Single way switch                | • Calling bell             |
| • Two way switch                   | • MCB                      |
| • Intermediate switch              | • MCCB                     |
| • TP switch                        | • Magnetic contactor       |
| • Change over switch               | • Indicating lamp          |
| • Ceiling fan                      | • Earthing                 |
| • Fan regulator                    | • Micro switch             |
| • Combined switched socket         | • Exhaust fan              |
| • Distribution board               | • Renewable fuse           |
|                                    | • Sub distribution board   |

Draw the symbols for the following equipment used in electrical installation.

- |              |         |
|--------------|---------|
| • OCB/VCB/CB | • Relay |
|--------------|---------|

- Transformer
- Motor (DC, AC)  
(3-phase & 1-phase)
- Generator
- Motor starter
- Battery
- Limit switch
- Rectifier unit
- Isolator
- Lightning arrester

**8 Develop the drawing of insulators used in transmission and distribution line.**

- 8.1 Draw the elevation, plan and section of a standard suspension type insulator.
- 8.2 Draw the elevation, plan and section of a 11 KV pin type insulator.
- 8.3 Draw the elevation plan and section of a shackle insulator used in LT distribution line.

**9 Develop the plan of a pole mounted sub-station.**

- 9.1 Draw the plan of a H-type pole structure.
- 9.2 Draw a transformer on the middle limb of the structure.
- 9.3 Sketch the dropout fuses on the top of the transformer.
- 9.4 Show the gang operated (GO) switch.
- 9.5 Show the incoming and outgoing lines.

**10 Develop the drawing of a LT distribution line (11KV/0.4KV)**

- 10.1 Draw the layout plan of a LT distribution line.
- 10.2 Draw the section of a pole showing the conductors.
- 10.3 Identify the line, neutral, earth and street lighting conductors.

**11 Construct an electrical layout diagram and circuit diagram of a residential building.**

- 11.1 Draw a layout diagram of a small residential building.
- 11.2 Show the electrical fittings and fixtures on the layout plan.
- 11.3 Show the switch boards, distribution boards, energy meter and protective devices in the section plan.
- 11.4 Sketch the section of the distribution board.
- 11.5 Sketch the section of a switch board.

**12. Set up the drawing environment and drawing aids.**

- 12.1 Start an ECAD Package and identify the different areas of ECAD screen.
- 12.2 Identify the menu bar, toolbar, drawing area and special windows for circuit simulation and testing purpose.
- 12.3 Familiarize with tools, toolkits and buttons (such as arrow, wire, text, delete etc)
- 12.4 Familiarize with workspace, conventions, preferences, shortcuts and hotkeys.
- 12.5 Place components such as resistors, transistors, power supply etc.
- 12.6 Save the drawing environment.
- 12.7 Exit from the ECAD package.

**13. Draw and edit schematic Circuits.**

- 13.1 Place devices (such as resistors, transistors, IC, power supply, grounds etc) in the workspace.
- 13.2 Reposition devices.
- 13.3 Edit devices with values and parameters.

- 13.4 Delete devices (if necessary).
- 13.5 Wire devices together.
- 14. Analyze a schematic Circuit.**
  - 14.1 Familiarize device meters, value sliders, goal seeker and circuit analyzer.
  - 14.2 Add device meter to circuit diagram and set device meter values.
  - 14.3 View Circuit voltage and current or digital logic level.
  - 14.4 Change a device value and quickly analyze the circuit.
  - 14.5 Perform DC and AC analysis of the circuit using circuit analyzer/oscilloscope.
  - 14.6 Generate and print a frequency response graph.
  - 14.7 Perform Digital analysis of a digital circuit.
  - 14.8 Generate logic level graphs by using digital clock and oscilloscope.
- 15. Organize the drawing information on layers.**
  - 15.1 Identify the layer control options.
  - 15.2 Create and name the layers.
  - 15.3 Make the layer current and control layer visibility.
  - 15.4 Freeze, lock and unlock the layers.
  - 15.5 Set the layer color & line type.

**-END-**

**Subject: Advanced Electronics**  
**Subject code: 6845**

**T**    **P**    **C**  
**3**    **3**    **4**

**1. Understand the concept of Uni-junction Transistor (UJT).**

Describe the Construction and operation of UJT.  
Sketch the UJT equivalent CKT and Explain.  
Define intrinsic stand off ratio.  
Explain the operation of a UJT Relaxation Oscillator.  
Explain the operation of UJT controlled SCR time Delay CKT.

**2. Understand the concept of Silicon Controlled Rectifier(SCR)**

Define Thyristor.  
Mention the types of thyristor.  
Describe the construction and operation of SCR.  
Describe the I-V Characteristics of SCR.  
Explain the operation of SCR using two Transistor equivalent CKT.  
Derive the Equation for anode current.  
Explain how to turn on & off of SCR.  
Define Various Parameters and mention the ratings of SCR.  
Draw the circuit diagram of Automatic battery charger and explain.

**3. Understand the concept of Controlled Rectifier.**

Mention the types of controlled Rectifier.  
Describe the operation of half wave controlled rectifier using SCR for resistive and inductive load with wave shape.  
Derive the equation for load current and voltage of half wave controlled rectifier for resistive and inductive load.  
Analyze the operation of single phase full wave mid point controlled, rectifier half controlled & full controlled bridge rectifier with wave shapes.  
Derive the Equation for load Current & voltage of Full Wave Rectifier.  
Draw the circuit and explain the operation of (a) Illumination CKT (b) speed controlled of DC & AC motors.

**4. Understand the concept of Programmable Uni-junction Transistor (PUT).**

Describe the construction and operation of the PUT.  
State how to set the trigger voltage of PUT.  
Explain the difference between a PUT & UJT.  
Analyze the operation of a PUT as relaxation oscillator.

**5. Understand the concept Of DIAC & TRIAC.**

Describe the construction & operation of DIAC.  
Explain the I-V characteristics curve of DIAC.  
Describe the construction of TRIAC.  
Explain the operation of equivalent ckt of TRIAC.  
Explain the triggering modes of TRIAC.  
Describe the characteristics curve of the TRIAC.  
Analyze the operation of TRIAC firing ckt using DIAC & UJT.  
Analyze the operation of a TRIAC phase control, Lamp dimmer & Heat Control circuit.

## **6. Understand the features of wave shaping Circuits.**

Mention the types of wave shaping circuit.

Describe the principles of RC & RL differentiating and integrating circuit.

Analyze the output wave for various input wave shapes of differentiating & integrating circuit.

Explain the operation of various Clippers by PN junction Diode bias, Zener Diode & Transistor.

Describe the operation of Diode Clamping circuit.

Describe the operating principle of Astable multivibrator using Transistor.

Describe the operating principle of Monostable multivibrator using Transistor.

Describe the operating principle of Bistable multivibrator using Transistor.

Describe the uses and Applications of Bistable Multivibrator.

## **7. Understand the features of integrated circuit (IC)**

7.1 Define IC.

7.2 List the Advantages and Limitation of IC's.

7.3 Mention the scale of Integration.

7.4 Identify the types of Integrated CKT.

7.5 Describe the fabrication monolithic IC.

7.6 Describe the fabrication Integrated CKT components  
Resistor, Capacitor, BJT & FET.

## **8. Understand the features of operational Amplifier (op-amp)**

State the basic principle of Operational Amplifier.

Analyze the Equivalent circuit of Operational Amplifier.

State the golden rule and virtual ground of Operational Amplifier.

List the characteristics of an ideal Operational Amplifier.

Describe the input & output impedance, input offset voltage, input bias current, input offset current, common mode input voltage range, open loop voltage gain, common mode rejection ratio, slew rate, frequency response and unity gain bandwidth.

Explain the operation of Operational Amplifier as inverter, scale changer, unity follower, comparator, phase shifter, adder, subtractor, differentiator, integrator, ramp generator, multi-channel amplifier and filters.

## **9. Understand the features of Advance Power Switching devices.**

9.1 Describe the construction of GTO, IGBT, MCT, SIT, SITH & LASCR.

9.2 Explain the principles of operation of GTO, IGBT, MCT, SIT, SITH & LASCR.

9.3 Mention the V-I characteristics of GTO, IGBT, MCT, SIT, SITH & LASCR.

9.4 List the application of various power switching devices.

## **10. Understand the feature of photo- resistor, diode & transistors.**

10.1 Describe the basic structure of photo resistors, photo diodes & Photo transistor.

10.2 Explain the operating principle of photo resistors, diodes & transistors.

10.3 Explain the V-I characteristics of photo resistors, photo diodes & photo transistors.

10.4 Explain a block diagram showing how photo detectors used in speed measuring system.

10.5 Explain the operation of photo Diode switching circuit.

10.6 Explain the operation of photo transistor switching circuit.

10.7 List typical applications of photo resistors, photo diodes & photo transistors.

## **12. Understand the concept of Flip-Flop, Encoder, Decoder, Multiplexer, De-Multiplexer, A/D & D/A Conversion, Digital Display**

Explain the working principle of J-K Flip-Flop with timing diagram & truth table.  
Explain the working principle of D-type Flip-Flop with timing diagram & truth table.  
Explain the working principle of Master-Slave Flip-Flop with timing diagram & truth table.  
Define and Discuss the application of Multiplexer & De-Multiplexer.  
Define and Discuss the application of shift register with proper CKT diagram.  
Define and Discuss the application of Binary counters with proper CKT diagram.  
Describe the process of D/A Conversion.  
Describe the process of A/D Conversion.  
Briefly Explain the constructional Details and working principles of LED & LCD Digital Display.

### **13. Understand the concept of Microprocessor, Microcontroller & PLC.**

Explain the Microprocessor & Microcontroller.  
Describe the microcontroller with block diagram.  
Describe the technique of interface to microprocessor controller.  
Describe the operation of PLC.  
Describe the method of connection of input/output device with PLC.  
Describe the control function of PLC controlled system.

## ***Practical:***

### **1. Study the characteristics curve of UJT.**

- 1.1 Select an appropriate experiment CKT, required materials, tools and equipments.
- 1.2 Connect the CKT as per diagram with meters.
- 1.3 Check the CKT and switch on the power supply.
- 1.4 Record the data for I-V curve.
- 1.5 Plot the curve.

### **2. Study the characteristics curve of SCR.**

- 2.1 Select an appropriate CKT, required tools equipments & materials.
- 2.2 Connect the CKT as per diagram with meters.
- 2.3 Switch on the power supply & make proper adjustments.
- 2.4 Set the gate control at minimum & observe the breakdown voltage for I-V characteristics.
- 2.5 Increase gate current in steps & observe the breakdown voltage.
- 2.6 Plot the I-V characteristics curve.
- 2.7 Compare different curve and breakdown voltage.

### **3. Study the operation of a single phase controlled rectifier using SCR.**

select an appropriate experiment CKT.  
Select required tools, equipment and materials.  
Connect the ckt as per diagram with oscilloscope.  
Check the connection and switch on the power supply.  
Observe the wave shapes at relevant points of the CKT.

### **4. Study the characteristics curve of DIAC.**

Select an appropriate CKT, required tools equipments & materials.  
Connect the CKT as per diagram with meters.  
Check the CKT and switch on the power supply.  
Record the data for I-V curve.  
Plot the curve.

**5. Study the operation of a RC differentiating CKT.**

Select a RC differentiating CKT.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram with CRO.  
Switch on the power supply.  
Adjust the signal frequency for the differentiating CKT.  
Observe the output wave for different input wave shape on CRO screen.

**6. Study the operation of a RC integrating circuit.**

Select a RC differentiating CKT.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram with CRO.  
Switch on the power supply.  
Adjust the signal frequency for the differentiating CKT.  
Observe the output wave for different input wave shape on CRO screen.

**7. Study the operation of positive and negative peak clipping of a sine wave using diode.**

Select the require CKT.  
Select the associate equipment and materials.  
Buildup the circuit for required wave shapes.  
Switch on the power supply.  
Observe the output on CRO screen.

**8. Study the operation of a clamping circuit.**

Select the require CKT.  
Select the associate equipment and materials.  
Buildup the circuit for required wave shapes.  
Switch on the power supply.  
Observe the output on CRO screen.

**9. Study the operation of op-amp (for IC 741) as inverting and non inverting amplifier, adder, comparator, buffer and subtractor.**

Select the require CKT.  
Select the associate equipment and materials.  
Buildup the circuit for required wave shapes.  
Switch on the power supply.  
Observe the output wave for different input wave shape on CRO screen.

**10. Study the operation of encoder.**

select an appropriate ICs.  
Draw the pin diagram and internal connection.  
Draw appropriate ckt.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram.

**11. Study the operation of decoder.**

Select an appropriate ICs.  
Draw the pin diagram and internal connection.  
Draw appropriate ckt.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram.  
Switch on the dc power supply.  
Verify the truth tables.

**12. Study the operation of multiplexer.**

Select an appropriate ICs.  
Draw the pin diagram and internal connection.  
Draw appropriate ckt.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram.  
Switch on the dc power supply.  
Verify the truth tables.

**13. Study the operation of demultiplexer.**

Select an appropriate ICs.  
Draw the pin diagram and internal connection.  
Draw appropriate ckt.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram.  
Switch on the dc power supply.  
Verify the truth tables.

**14. Study & Verify the truth table of different j-k flip flops.**

Select an appropriate ICs.  
Draw the pin diagram and internal connection.  
Draw appropriate ckt.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram.  
Switch on the dc power supply.  
Verify the truth tables.

**15. Study & Verify the truth table of different D flip flops.**

Select an appropriate ICs.  
Draw the pin diagram and internal connection.  
Draw appropriate ckt.  
Select required tools, equipment and materials.  
Connect the CKT as per diagram.  
Switch on the dc power supply.  
Verify the truth tables.

**16. Study the operation of a Illumination CKT.**

- 16.1 Select an appropriate experiment CKT.
- 16.2 Select required tools, equipment and materials.
- 16.3 Connect the ckt as per diagram.
- 16.4 Check the connection and switch on the power supply.
- 16.5 Adjust the POT and observe the illumination.

### ***Reference Books:***

1. Power Electronics Ckts Devices and Applications (3<sup>rd</sup> Edition) by Muhammad H. Rashid
2. Electronics and Radio Engineering by M.L Gupta
3. Industrial And Power Electronics by G.K Mithal and Dr. Manesha Gupta
4. Principle of Electronics by V.K Mehta
5. Power Electronics by Dr. P.S Bimbhra
6. Electronic Devices & Circuits(Applied Electronics by K.G MITHAL, Vol-1)
7. Electronic Devices & Circuit Theory(9<sup>Th</sup> Edition) by Robert L. Boylestad, Louis Nashelsky.
8. Electronic Devices & Circuits by Millman Halkis
9. Digital Computer Electronics(3<sup>Rd</sup> Edition) by Malvino, Brown
10. Electronic principle (7<sup>th</sup> Edition) by Albert Malvino D.J Bats)
11. Modern digital electronics (3rd edition) by R.P Jain

## 5941 APPLIED MATHEMATICS

T	P	C
3	3	4

### AIMS

- To be able to apply differentiation, differential operator and vector integration in finding length, area, volume and different terms of science & technology.
- To be able to use the knowledge of Stokes theorem to transfer the volume integration into line integration.
- To enable to apply knowledge of differential calculus in solving minimum cost of production, maximum bending moment, rate of flow of liquids, efficiency when motor does maximum work.
- To be able to use the knowledge of differential equation to solve the problems of SHM, fluid mechanics, strength of materials, work, energy, power, impedance, reactance, hydro-dynamics and velocity of a particle in space.
- To use the knowledge of Laplace transformation to solve the boundary differential equations and to find the impedance and reactance of the electric circuit.

### SHORT DESCRIPTION

**Vector :** Vector differentiation; Vector differential operator; Vector integration; Green's theorem; Gauss divergence theorem and Stokes theorem.

**Calculus:** Tangent and normal; Maximum and minimum; Special types of integration; Reduction formula.

**Differential Equation:** Solution of first degree and first order differential equations; First degree and second order differential equations; Fourier's series, Laplace transformation.

### DETAIL DESCRIPTION

#### Vector :

1. **Understand vector differentiation.**
  - 1.1 Explain the differentiation of Vectors.
  - 1.2 Differentiate the vector function using
    - i) General rules of differentiation.
    - ii) General rules of partial differentiation.
  - 1.3 Solve the problems related to vector differentiation.
2. **Understand the vector differential operator.**
  - 2.1 Define vector differential operator.

- 2.2 Define gradient, divergence and curl.
- 2.3 Mention the formulae involving vector differential operator.
- 2.4 Solve the problems related to vector differential operator, gradient, divergence and curl.

**3. Understand vector integration.**

- 3.1 Interpret the following vector integration :
  - i) The line integral.
  - ii) The surface integral.
  - iii) The volume integral.
- 3.2 Solve problems related to vector integration.

**4. Understand the theorems of vector integration.**

- 4.1 State Greens theorem in the plane.
- 4.2 Express the proof of Green's theorem.
- 4.3 State Gauss divergence theorem.
- 4.4 Express the proof of Gauss divergence theorem.
- 4.5 State and prove Stokes theorem.
- 4.6 **Solve simple problems using Gauss divergence theorem and Stokes theorem.**

**Calculus :**

**5 Apply the concept of tangent and normal to a curve in solving problems.**

**5.1 Deduce the equation of tangent and normal in the form:**

i)  $Y - y = \frac{dy}{dx} (X - x)$     ii)  $(X - x) + (Y - y) \frac{dy}{dx} = 0$

**5.2 Find the formula for angle between two curves.**

**5.3 Define sub-tangent and sub-normal.**

**5.4 Find the length of sub-tangent and sub-normal .**

**5.5 Solve the problems involving tangent, normal, sub-tangent and sub-normal.**

**6 Apply the knowledge of derivatives in finding the maximum and minimum values of a function.**

**6.1 Define increasing and decreasing function.**

**6.2 Understand the maximum and minimum values of a function.**

**6.3 Discuss the working rule to find the maximum and minimum values of a function.**

**6.4 Solve the problems involving maximum and minimum values.**

**7. To perform the special types of integration.**

7.1 Integrate of the following form :

(i)  $\int \frac{dx}{ax^2 + bx + c}$                       (ii)  $\int \frac{dx}{\sqrt{ax^2 + bx + c}}$

(iii)  $\int \sqrt{ax^2 + bx + c} dx$                       (iv)  $\int \frac{dx}{(ax + b)\sqrt{cx + d}}$

(v)  $\int \frac{dx}{(ax + b)\sqrt{ax^2 + bx + c}}$                       (vi)  $\int \frac{px + q}{ax^2 + bx + c} dx$

**8. Understand the reduction formula.**

8.1 Express the deduction of reduction formula for

i)  $\int \sin^n x \, dx$     ii)  $\int \cos^n x \, dx$

iii)  $\int x^n e^n \, dx$     iv)  $\int x^n \cos x \, dx$ , when n is even and when n is odd.

8.2 Obtain reduction formula for  $\int \sin^m x \cos^n x \, dx$

8.3 Solve problems related to reduction formula.

Differential equation:

9. Understand differential equation of first order and first degree.

**9.1 Define order and degree of differential equation.**

**9.2 Solve the following forms of differential equations.**

i) **Variable separable.**

ii) **Homogeneous equation.**

iii) **Exact equations.**

iv) **Linear equations.**

**10. Understand second order differential equation.**

10.1 Solve linear equations with constant co-efficient.

10.2 Solve linear equations with variable co-efficient.

**10.3 Solve the differential equation of the form  $f(D)y = f(x)$**

11. Understand Fourier's theorem.

**11.1 State Fourier's theorem in the form**

$$y=f(x)=A_0+A_1\sin x+A_2\sin 2x+\dots+A_n\sin nx$$

$$+B_1\cos x+B_2\cos 2x+\dots+B_n\cos nx.$$

**11.2 Determine the co-efficient of Fourier's series.**

**11.3 Solve simple problems using Fourier's series.**

**12 Understand Laplace transformation.**

10.3 Define Laplace transformation in the form  $F(s) = \int_0^{\infty} f(t)e^{-st} \, dt$

12.2 Express the deduction of Laplace transformation of the following functions :

i) constant    (ii) t    (iii)  $t^n$     (iv)  $e^{at}$

(v)  $\sin at$     (vi)  $\cos at$     (vii)  $e^{at}t^n$     (viii)  $e^{at} \sin bt$

(ix)  $e^{at} \cos bt$     (x)  $\sin h at$     (xi)  $\cos h at$

12.3 Find the Laplace transformation of

(i)  $f'(t)$     (ii)  $f''(t)$     (iii)  $f'''(t)$

12.4 Define inverse Laplace transformation.

12.5 Solve second order differential equation with the help of Laplace transformation.

12.6 Solve problems related to Laplace transformation and inverse Laplace transformation

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**উদ্দেশ্য**

- পদ্মা-মেঘনা-যমুনা বদ্বীপ অধ্যুষিত ভৌগোলিক অঞ্চলে বাঙ্গালী সমাজ গঠন এবং নানা ঐতিহাসিক বিবর্তনের পর্যায় পেরিয়ে গঠিত আধুনিক বাংলাদেশ সম্পর্কে শিক্ষার্থীদের যথার্থ অবগত করানো এবং তাদের সঠিক বোধ সৃষ্টিকরণ।
- প্রাকৃতিক ও অর্থনৈতিক কাঠামোর পরিমন্ডলে বাংলাদেশের সাংস্কৃতিক বিকাশের সাথে শিক্ষার্থীদের উজ্জীবিত করে বাংলাদেশের যোগ্য ও পরিশীলিত নাগরিক হিসাবে যথার্থ বিকাশিতকরণ।

**সংক্ষিপ্ত বিবরণী**

## ইতিহাস

- ইতিহাসের সংজ্ঞা।
- বাংলাদেশের আবহাওয়া ও অধিবাসী।
- প্রাগৈতিহাসিক ও প্রাচীনকালে বাংলাদেশ।
- বাংলায় মুসলমানদের আগমন, প্রতিষ্ঠালাভ ও শাসন – খলজী ও তুর্কী শাসনে বাংলায় স্বাধীন সুলতানী প্রতিষ্ঠা; বাংলাদেশে শাহী আমল, আফগান ও মোঘল আমলে বাংলার শাসন।
- বাংলায় ইউরোপীয় বণিকদের আগমন; নবাবী আমলে বাংলার শাসন ব্যবস্থা; বাংলায় ইংরেজ শাসন ক্ষমতা লাভ ও প্রতিষ্ঠা।
- ব্রিটিশ বিরোধী সশস্ত্র প্রতিরোধ আন্দোলন; সংস্কার আন্দোলন ও জাতীয়তাবাদের বিকাশ এবং বাংলার নবজাগরণ; বঙ্গভঙ্গ ও বঙ্গভঙ্গ উত্তরকালে বাংলার রাজনীতি ও দেশ বিভাগ।
- পাকিস্তান আমলে বাংলাদেশ এবং বাংলাদেশের মুক্তি সংগ্রাম ও যুদ্ধ।

## সংস্কৃতি

সংস্কৃতির সংজ্ঞা, আদিযুগে বাংলার সমাজ-সংস্কৃতির রূপরেখা, সুলতানী, মোঘল ও নবাবী আমলের বাংলার সমাজ সংস্কৃতি; ইংরেজ আমলে বাংলার সমাজ ও সংস্কৃতি।

রবীন্দ্র ও নজরুল যুগ এবং রবীন্দ্র ও নজরুল উত্তর বাংলার সমাজ ও সংস্কৃতি; পাকিস্তান আমলে বাংলাদেশের সাংস্কৃতিক রূপরেখা; স্বাধীনতাউত্তর বাংলাদেশের সংস্কৃতি।

## বিশদ বিবরণী

### ইতিহাস

1. ইতিহাসের সংজ্ঞা, প্রাগৈতিহাসিক আমলের বাংলাদেশ এবং বাংলাদেশের আবহাওয়া ও অধিবাসী সম্পর্কে অবগত হওয়া।
  - 1.1 ইতিহাসের সংজ্ঞা প্রদান।
  - 1.2 বাংলাদেশের প্রাচীন জনপদ উল্লেখ করা।
  - 1.3 বঙ্গ বা বাংলা নামের উৎপত্তি ব্যাখ্যা করা।
  - 1.4 বঙ্গের সীমারেখা চিহ্নিত করা।
  - 1.5 বাংলার আবহাওয়া ও এর অধিবাসীদের চরিত্রে আবহাওয়ার প্রভাব বিবৃত করা।
  - 1.6 প্রাগৈতিহাসিক ও প্রাচীন বাংলার আর্থসামাজিক ব্যবস্থা বর্ণনা করা।
2. বাংলাদেশে গুপ্ত, রাজা শশাঙ্ক, পাল ও মুসলিম শাসন সম্পর্কে অবগত হওয়া।
  - 2.1 গুপ্ত শাসন আমলে বাংলার শাসনব্যবস্থা বর্ণনা করা।
  - 2.2 রাজা শশাঙ্কের রাজ্য বিজয় ও শাসন বর্ণনা করা।
  - 2.3 বাংলার অরাজকতা ও হিউয়েনসাং এর আমলে বাংলার অবস্থা বর্ণনা করা।
  - 2.4 গোপাল কর্তৃক অরাজকতার অবসান ঘটানোর কৃতিত্বের বর্ণনা করা।
  - 2.5 বাংলাদেশে মুসলমানদের আগমন ও বখতিয়ার খলজীর বাংলা বিজয় বর্ণনা করা।
  - 2.6 বাংলাদেশে স্বাধীন সুলতানী শাসন প্রতিষ্ঠায় শামছুদ্দিন ইলিয়াশ শাওরীর কৃতিত্ব বর্ণনা করা।
  - 2.7 বাংলায় মোঘল শাসনের ইতিবৃত্ত ব্যাখ্যা করা।
  - 2.8 ১৭৫৭ সালের পলাশীর যুদ্ধের কারণ, ঘটনা ও ফলাফল বর্ণনা করা।
3. পলাশীযুদ্ধ পরবর্তী অবস্থায় ইস্ট ইন্ডিয়া কোম্পানীর আধিপত্য বিস্তার সম্পর্কে জ্ঞাত হওয়া।
  - 3.1 দেওয়ানী, দ্বৈতশাসন ও বাংলার দুর্ভিক্ষ বর্ণনা করা।
  - 3.2 ইংরেজদের চিরস্থায়ী বন্দোবস্ত এবং এর ফলাফল বর্ণনা করা।
  - 3.3 বাংলাদেশে জমিদার, প্রজাব্যবস্থা প্রতিষ্ঠা এবং আর্থ-সামাজিক ব্যবস্থায় জমিদারদের ভূমিকা ও প্রজাকুলের সার্বিক অবস্থা উল্লেখ করা।
  - 3.4 ১৯০৫ সালের বঙ্গভঙ্গ আন্দোলন ও ফলাফল ব্যাখ্যা করা।
  - 3.5 হাজী শরীয়ত উল-হর ফরায়াজী আন্দোলন ও এর ফলাফল ব্যাখ্যা করা।
4. বঙ্গভঙ্গউত্তর রাজনীতি ও দেশ বিভাগ সম্পর্কে অবহিত হওয়া।
  - 4.1 ১৯৩৭ এর নির্বাচন ও এর বৈশিষ্ট্য উল্লেখ করা।
  - 4.2 লাহোর প্রস্তাব ব্যক্ত করা।

- ৪.৩ ১৯৪৩ এর বাংলার দুর্ভিক্ষের কারণ ও এর পূর্বাপর অবস্থা উলে- খ করা।  
৪.৪ পাকিস্তানের পূর্বাঞ্চল হিসাবে ১৯৪৭ সালে পূর্ব পাকিস্তানের প্রতিষ্ঠা ব্যাখ্যা করা।

৫. পাকিস্তান আমলে বাংলাদেশের (তৎকালীন পূর্ব পাকিস্তান) রাজনীতি, অর্থনীতি ও সামাজিক অবস্থা সম্পর্কে অবগত হওয়া।  
৫.১ ভাষা আন্দোলন ও সমকালীন রাজনৈতিক ও সামাজিক প্রেক্ষিত ব্যক্ত করা।  
৫.২ আওয়ামীলীগ প্রতিষ্ঠা, যুক্তফ্রন্ট ও ২১ দফা দাবীর ভিত্তিতে নির্বাচন অনুষ্ঠান এবং যুক্তফ্রন্টের মন্ত্রিসভা গঠন ও বাতিল আলোচনা করা।  
৫.৩ পাকিস্তানের সামরিক অভ্যুত্থান, আইয়ুব বিরোধী আন্দোলন ও ৬ দফা দাবী, আগরতলা ষড়যন্ত্র মামলার ইতিবৃত্ত বর্ণনা করা এবং পূর্ব-পশ্চিম পাকিস্তানের অর্থনৈতিক বৈষম্যের খতিয়ান উলে- খ করা।  
৫.৪ ১৯৬৯ সালের গণঅভ্যুত্থান এবং এর ধারাবাহিকতায় বাংলাদেশের মুক্তিযুদ্ধ ও স্বাধীন সার্বভৌম বাংলাদেশ প্রতিষ্ঠা করার পটভূমি ও ঘটনা প্রবাহ বর্ণনা করা।  
৫.৫ ১৯৭১ সালের ঐতিহাসিক মুক্তিযুদ্ধ এবং স্বাধীন সার্বভৌম বাংলাদেশের অভ্যুদয় বর্ণনা করা।

৬. স্বাধীন সার্বভৌম বাংলাদেশের রাজনীতি ও আর্থ-সামাজিক অবস্থা সম্পর্কে অবগত হওয়া।  
৬.১ যুদ্ধোত্তর স্বাধীন সার্বভৌম বাংলাদেশের আর্থ-সামাজিক পুনর্গঠন কর্মতৎপরতা বর্ণনা করা।  
৬.২ ১৯৭৩ সালের নির্বাচন এবং ১৯৭৪ সালে সংবিধানের ৪র্থ সংশোধনীর মাধ্যমে সরকার পদ্ধতির পরিবর্তন ব্যক্ত করা।  
৬.৩ ১৯৭৫ সালের ১৫ আগস্ট জাতির জনক বঙ্গবন্ধু শেখ মুজিবুর রহমান -এর শাহাদাত বরণ এবং রাজনৈতিক পটপরিবর্তন।  
৬.৪ ১৯৮১ সালে রাষ্ট্রপতি জিয়াউর রহমানের শাহাদাত বরণ, ১৯৮২ সালের সামরিক অভ্যুত্থান এবং রাজনৈতিক পটভূমি পরিবর্তন।  
৬.৫ ১৯৯০ সালে এরশাদ সরকারের পতন এবং তত্ত্বাবধায়ক সরকার পদ্ধতি অনুসঙ্গে ১৯৯১ সনের নির্বাচন এবং গণতান্ত্রিক অনুশীলনের সূচনা।

## সংস্কৃতি

৭. সংস্কৃতির সংজ্ঞা এবং প্রাচীন ও মধ্যযুগীয় বাংলার সংস্কৃতি ও সাহিত্য চর্চা সম্পর্কে অবগত হওয়া।  
৭.১ সংস্কৃতির সংজ্ঞা দান।  
৭.২ প্রাচীন বাংলার ভাষা সাহিত্য ও সংস্কৃতির রূপরেখা বর্ণনা করা।  
৭.৩ বাঙ্গালী সংস্কৃতি নির্মাণে মর্সিয়া ও পুঁথি সাহিত্যের প্রভাব বর্ণনা করা।
৮. আধুনিক যুগে বাংলাদেশের সংস্কৃতি ও বাংলাভাষার আধুনিক রূপলাভ সম্পর্কে অবগত হওয়া।  
৮.১ ইংরেজ শাসন আমলে সামাজিক কুসংস্কার দূরীকরণে (স্যার সৈয়দ আহমদ, সৈয়দ আমীর আলী ও রাজা রামমোহন রায়) এর আবির্ভাব এবং তাদের কর্মতৎপরতা ব্যাখ্যা করা।  
৮.২ ক্যারি সাহেব এবং ফোর্ট উইলিয়াম কলেজ/সংস্কৃত কলেজ স্থাপনের মাধ্যমে বাংলার নতুন সংস্কৃতির রূপলাভ বর্ণনা করা।  
৮.৩ ইংরেজদের শিক্ষানীতি প্রবর্তন ব্যাখ্যা করা এবং কলিকাতা বিশ্ববিদ্যালয় ও ইসলামিয়া মাদ্রাসা স্থাপনের মাধ্যমে বাংলার সংস্কৃতির বিকাশ ব্যক্ত করা।  
৮.৪ ঢাকা বিশ্ববিদ্যালয় প্রতিষ্ঠার ইতিবৃত্ত ব্যাখ্যা করা।
৯. ১৯৪৭ এর দেশ বিভাগ ও সাংস্কৃতিক অবস্থার পরিবর্তন সম্পর্কে অবগত হওয়া।  
৯.১ তৎকালীন পূর্ব পাকিস্তানের তমুদুন মজলিসের ভূমিকা উলে- খ করা।  
৯.২ ১৯৫২ সালের ভাষা আন্দোলনের সাংস্কৃতিক গুরুত্ব উলে- খ করা।  
৯.৩ ঢাকা কেন্দ্রিক শিল্পী-সাহিত্যিকদের বাংগালী সংস্কৃতি বিনির্মাণের ভূমিকা পালন উলে- খ করা।  
৯.৪ '৬৯ এর গণ আন্দোলনে সাংস্কৃতিক কর্মীদের ভূমিকা উলে- খ করা।  
৯.৫ বাঙলা একাডেমীর প্রতিষ্ঠা এবং বাংলা ভাষা ও সাহিত্যে এর ভূমিকা উলে- খ করা।  
৯.৬ আন্তর্জাতিক মাতৃভাষা দিবস হিসেবে ২১ ফেব্রুয়ারির তাৎপর্য ব্যক্ত করা।  
৯.৭ ভাষা, শিল্প সাহিত্য চর্চায় সংবাদপত্র ও ইলেকট্রনিক মিডিয়ার ভূমিকা উলে- খ করা।

১০. সংস্কৃতির উপর গ্রামীণ অর্থনীতির প্রভাব অবগত হওয়া।  
১০.১ তাঁত শিল্প ও মসলিন উৎপাদনের ইতিবৃত্ত ব্যাখ্যা করা।  
১০.২ পাট চাষের অর্থনৈতিক প্রভাব ব্যক্ত করা।  
১০.৩ বাঙ্গালী সংস্কৃতির অংশ হিসেবে দুধজাত মিশ্রিত সামগ্রীর (মিষ্টি, মাখন, দধি, পিঠা-পুলি প্রভৃতি) প্রভাব ব্যক্ত করা।  
১০.৪ দেশীয় মেলা ও পার্বনের সাংস্কৃতিক গুরুত্ব ব্যাখ্যা করা।  
১০.৫ গ্রামীণ পেশাজীবীদের (কামার, কুমার, তাঁতী, জেলে, ছুতার, ইত্যাদি) সাংস্কৃতিক গুরুত্ব ব্যাখ্যা করা।

১১. বাংলাদেশের সংস্কৃতিতে আদিবাসী সংস্কৃতি ও প্রত্ন তাত্ত্বিক নিদর্শনের অবদান সম্পর্কে অবগত হওয়া।
- ১১.১ বাংলাদেশের আদিবাসী সম্পর্কে উল্লেখ করা।
- ১১.২ বাংলাদেশের সংস্কৃতিতে গাড়া, রাখাইন, সাওতাল, চাকমা আদিবাসীদের সংস্কৃতিক অবদান ব্যাখ্যা করা।
- ১১.৩ বাংলাদেশের প্রাচীন সংস্কৃতির ঐতিহ্য হিসাবে মহাস্থানগড়, ময়নামতি ও পাহাড়পুরের প্রত্নতাত্ত্বিক নিদর্শনের বর্ণনা দান।

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<b>5841</b>	<b>BUSINESS ORGANIZATION &amp; COMMUNICATION</b>	<b>T</b>	<b>P</b>	<b>C</b>
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## **AIMS**

- To be able to understand the basic concepts and principles of business organization.
- To be able to understand the banking system.
- To be able to understand the trade system and stock exchange activities in Bangladesh.
- To be able to understand the basic concepts of communication and its types, methods.
- to be able to perform in writing , application for job, complain letter & tender notice.

## **SHORT DESCRIPTION**

Principles and objects of business organization; Formation of business organization; Banking system and its operation; Negotiable instrument; Stock Exchange; Home trade and foreign trade.

Basic concepts of communication Communication model& feedback; Types of communication; Methods of communication; Formal & informal communication; Essentials of communication; Report writing; Office management; Communication through correspondence; Official and semi-official letters.

## **DETAIL DESCRIPTION**

### **1 Understand business organization.**

- 1.1 Define business.
- 1.2 Mention the objects of business.
- 1.3 Define business organization.
- 1.4 State the function of business organization.

### **2 Understand the formation of business organization.**

- 2.1 Define sole proprietorship, partnership, joint stock company. and co-operative
- 2.2 Describe the formation of sole proprietorship, partnership , joint stock company, & co operative.
- 2.3 Mention the advantages and disadvantages of proprietorship, partnership and joint stock company.
- 2.4 State the principles of Co operative & various types of Co operative.
- 2.5 Discuss the role of co-operative society in Bangladesh.

- 3 Understand the banking system and negotiable instrument.**
- 3.1 Define bank.
  - 3.2 State the service rendered by bank.
  - 3.3 Describe the classification of bank in Bangladesh.
  - 3.4 State the functions of Bangladesh Bank in controlling money market.
  - 3.5 State the functions of commercial Bank in Bangladesh
  - 3.6 Mention different types of account operated in a bank.
  - 3.7 Mention how different types of bank accounts are opened and operated.
  - 3.8 Define negotiable instrument.
  - 3.9 Discuss various types of negotiable instrument.
  - 3.10 Describe different types of cheque.
  - 3.11 Define letter of credit.
- 4 Understand the home & foreign trade**
- 4.1 Define home trade & foreign trade.
  - 4.2 Describe types of home trade.
  - 4.3 Differentiate between whole sale trade and retail trade.
  - 4.4 Define foreign trade.
  - 4.5 Mention the advantages and disadvantages of foreign trade.
  - 4.6 Mention the classification of foreign trade.
  - 4.7 Discuss the import procedure & exporting procedure.
  - 4.8 Discuss the importance of foreign trade in the economy of Bangladesh.
- 5 Understand the basic concepts of communication**
- 5.1 Define communication & business communication.
  - 5.2 Describe the scope of business communication.
  - 5.3 State the objectives of business communication.
  - 5.4 Discuss the essential elements of communication process.
- 6 Understand the communication model and feedback.**
- 6.1 Define communication model.
  - 6.2 State the business functions of communication model.
  - 6.3 Define feedback .
  - 6.4 State the basic principles of effective feedback.
  - 6.5 Explain the essential feedback to complete communication process.
- 7 Understand the types of communication.**
- 7.1 Explain the different types of communication.
  - 7.2 Distinguish between upward and downward communication.
  - 7.3 Define two-way communication.
  - 7.4 Describe the advantages and disadvantages of two-way communication.
  - 7.5 Define formal & informal communication.
  - 7.6 Describe the advantages and disadvantages of formal & informal communication.
  - 7.7 Distinguish between formal and informal communication.
- 8 Understand the methods of communication.**
- 8.1 Define communication method.
  - 8.2 Discuss the various methods of communication.
  - 8.3 Describe the advantages and disadvantages of oral communication.
  - 8.4 Describe the advantages and disadvantages of written communication.

8.5 Distinguish between oral and written communication.

**9 Understand the essentials of communication.**

9.1 Discuss the essential feature of good communication.

9.2 Describe the barriers of communication.

9.3 Discuss the means for overcoming barriers to good communication.

**10 Understand the report writing.**

10.1 Define report, business report & technical report.

10.2 State the essential qualities of a good report.

10.3 Describe the factors to be considered while drafting a report.

10.4 Explain the components of a technical report.

10.5 Distinguish between a technical report and general report.

10.6 Prepare a technical report.

**11 Understand the office management.**

11.1 Define office and office work.

11.2 State the characteristics of office work.

11.3 Define filing and indexing.

11.4 Discuss the methods of filing.

11.5 Discuss the methods of indexing.

11.6 Distinguish between filing and indexing.

**12 Understand the official and semi-official letters.**

12.1 State the types of correspondence.

12.2 State the different parts of a commercial letter.

12.3 Define official letter and semi-official letter.

12.4 Distinguish between official letter and semi-official letters.

12.5 Prepare the following letters: Interview letter, appointment letter, joining letter and application for recruitment. Complain letters, tender notice.