

CHEMICAL TECHNOLOGY (63)

3rd 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	6331	Chemical Engineering. Operation-1	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	Physics-2	3	3	4	30	120	25	25	200
6	5811	Social Science-1	2	0	2	20	80	-	-	100
7	1012	Engineering Materials	2	3	3	20	80	25	25	150
		Total	15	21	22					1100

CHEMICAL TECHNOLOGY (63)

4th 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	6341	Chemical Engineering Operation-2	3	3	4	30	120	25	25	200
2.	6342	Chemical process Industries-1	3	3	4	30	120	25	25	200
3.	6745	Electrical Circuits & Machines	2	3	3	20	80	25	25	150
4	6832	Industrial Electronic	2	3	3	20	80	25	25	150
5.	7042	Machine Shop Practice	1	6	3	10	40	50	50	150
6.	5821	Social Science -2	2	-	2	20	80	-	-	100
7	5841	Business Organization and Communication	2	-	2	20	80	-	-	100
		Total	15	18	21					1050

AIMS

- To provide knowledge and skills of heat transfer, heat exchangers and boilers.
- To develop knowledge and skill in the operation and maintenance of heat exchanger, boiler, water treatment plant, water demineralization plant.

SHORT DESCRIPTION

Heat transfer by conduction, convection and radiation; Heat exchangers; Boilers; Boiler mountings & accessories; Properties & uses of steam; Thermal insulation.

DETAILED DESCRIPTION**Theory :****HEAT TRANSFER****1 Understand the concept of heat transfer.**

- 1.1 State the meaning of heat transfer.
- 1.2 Mention the basic considerations of heat transfer.
- 1.3 Explain the meaning of “heat transfer co-efficient” and “overall heat transfer co-efficient”.
- 1.4 Explain the meaning of “log mean temperature difference(LMTD)”.
- 1.5 Solve the problems on overall heat transfer co-efficient and mean temperature difference.

HEAT TRANSFER BY CONDUCTION**2 Understand the heat transfer by conduction.**

- 2.1 Explain the Fourier’s law.
- 2.2 Explain thermal conductivity and its units.
- 2.3 Explain the conduction of heat through a plane wall.
- 2.4 Explain the thermal resistances in series.
- 2.5 Explain the conduction through a thick-walled tube.
- 2.6 Explain the conduction to a sphere.
- 2.7 Solve the simple problems on heat transfer by conduction.

HEAT TRANSFER BY CONVECTION**3 Understand the heat transfer by convection.**

- 3.1 Define heat transfer by convection.
- 3.2 Explain the film coefficient for convection.
- 3.3 Explain different types of convection.
- 3.4 Explain combined effect of heat transfer by conduction and convection.
- 3.5 Deduce the equation for overall heat transfer coefficient.
- 3.6 Explain the Nusselt’s number (Nu), Reynold’s number (Re), Prandlt’s number (Pr) and Grashof’s number (Gr) of heat transfer by convection
- 3.7 Solve the problems on heat transfer by convection.

HEAT TRANSFER BY RADIATION**4 Understand the heat transfer by radiation.**

- 4.1 Define absorbtivity, reflectivity and transmissivity of heat through a body.
- 4.2 State the meaning of black body and white body.
- 4.3 Explain the Kirchoff’s law of heat transfer by radiation.
- 4.4 Explain the energy emission by a black body.
- 4.5 Explain the heat transfer by radiation.

HEAT EXCHANGERS

5 Understand the features of heat exchangers.

- 5.1 Define heat exchangers.
- 5.2 Explain different types of heat exchangers.
- 5.3 Draw and explain temperature profile of parallel current and counter current heat exchangers.
- 5.4 Explain log mean temperature difference (LMTD) for parallel-current and counter current heat exchangers.
- 5.5 solve problem on heat exchangers.

BOILER (STEAM GENERATOR)

6 Understand the features of boilers.

- 6.1 Mention the classification of boilers.
- 6.2 Distinguish between internally fire tube and externally fire tube boiler.
- 6.3 Write the advantages and disadvantages of fire tube boiler.
- 6.4 Write the advantages and disadvantages of water tube boiler.
- 6.5 Describe the construction of common types of boiler.
- 6.6 Describe the operation of common types of boiler.
- 6.7 Mention the precautions for boiler operation system
- 6.8 State the general maintenance of boilers.

BOILER MOUNTINGS

7 Understand the features of boiler mountings.

- 7.1 State what is meant by boiler mountings.
- 7.2 Identify the boiler mountings.
- 7.3 Mention the function of water level indicator, plain gage glass, pressure gage and safety valve of a boiler.
- 7.4 Describe the working principles of common safety valves.
- 7.5 Describe the construction of the feed check valve, blow down cock and fusible plug.
- 7.6 Mention the function of the feed check valve, blow down cock and fusible plug.

BOILER ACCESSORIES

8 Understand the features of boiler accessories.

- 8.1 State the meaning of boiler accessories.
- 8.2 List the different types of boiler accessories.
- 8.3 Explain the boiler accessories.
- 8.4 Mention the function of various boiler accessories.

BOILER AUXILIARIES

9 Understand the features of boiler auxiliaries.

- 9.1 State the meaning of boilers auxiliaries.
- 9.2 List the different types of boiler auxiliaries.
- 9.3 Identify and explain the boiler auxiliaries.
- 9.4 Mention the functions of various boiler auxiliaries.
- 9.5 Mention the specification of boiler feed water.
- 9.6 Describe different types of boiler feed water treatment.

STEAM, ITS PROPERTIES & USES

10 Understand the aspects of steam.

- 10.1 Mention the properties of steam.
- 10.2 Mention the properties of saturated steam.
- 10.3 State the meaning of dry and wet steam.
- 10.4 State the meaning of superheated steam.
- 10.5 Explain the uses of superheated steam.
- 10.6 List the advantages of superheated steam.
- 10.7 Explain the specific heat of superheated steam.
- 10.8 Mention the uses of steam chart (table) and steam diagrams

THERMAL INSULATION

11 Understand the aspects of thermal insulation.

- 11.1 State the meaning of thermal insulation.
- 11.2 List the thermal insulating materials.
- 11.3 Mention the characteristics of thermal insulating materials.
- 11.4 Mention the application of thermal insulation.
- 11.5 State the economic thickness of lagging by thermal insulating materials.

Practical :

- 1 Study a double pipe heat exchanger.
- 2 Operate a double pipe heat exchanger.
- 3 Study a shell and tube heat exchanger.
- 4 Study the principles of operation of a air cooled condenser
- 5 Study the principles of operation of a water cooled condenser.
- 6 Construct a solar dryer to study the heat absorbtivity of black body.
- 7 Study a water tube boiler.
- 8 Operate a water tube boiler.
- 9 Perform the maintenance of a water tube boiler.
- 10 Study a fire tube boiler.
- 11 Operate a fire tube boiler.
- 12 Perform the maintenance of a fire tube boiler.
- 13 Study the principle of operation of a super heater.
- 14 Operate the electric boiler.
- 15 Perform the maintenance of an electric boiler.
- 16 Determine the effective thickness of lagging in a steam pipe line.

REFERENCE BOOKS

- 1. Chemical Engineering operation-2
– Engr. A K Md. Wahidul Haque
- 2. Chemical Engineering, Volume I and II (Third edition)
– J. M Coulson and J. F. Richardson
- 3. Chemical Engineering, Vol IV & V
– J. R. Backhurst and J. H. Harker
- 4. Unit Operations of Chemical Engineering, Fifth edition
– McCabe and Smith
- 5. Introduction to Chemical Engineering
– Badger and Banchero
- 6. Chemical Enginnering Hand Book
– Perry
- 7. Food Engineering Operations
– Brennan and Baters, Cowell and Lilly
- 8. Heat Transfer
– J.P. Hollman
- 9. Heat Engine
– N. A. Khan
- 10. Boiler
– Muhammad Mahboobur Rahman
Muhammad Ashiqur Rahman

6342	CHEMICAL PROCESS INDUSTRIES – I	T	P	C
		3	3	4

AIMS

- To be able to understand the basic concepts of water treatment, manufacturing of pigments, paints and varnishes, oil, fats and waxes, leather processing and textile processing.
- To develop skill in water treatment, paint manufacturing, varnish manufacturing, chrome and vegetable tanning, fats & oils analysis, hydrogenation of oil, refining of oils and wet process for yarn.

SHORT DESCRIPTION

Water treatment; Manufacturing of pigments; paints and varnishes; oils, fats and waxes; Leather processing and textile processing.

DETAIL DESCRIPTION

Theory :

WATER TREATMENT

- 1 Understand the concept of water treatment.**
 - 1.1 Define water treatment.
 - 1.2 List the impurities in water.
 - 1.3 Explain the treatment of water for municipal purpose.
 - 1.4 Explain the softening of water by lime-soda process.
 - 1.5 Explain the softening of water by organic ion exchanger.
 - 1.6 Describe the demineralization of water.
 - 1.7 Explain the process of water treatment for high pressure boilers.
- 2 Understand the analysis of water.**
 - 2.1 Mention the water analysis for industrial water.
 - 2.2 Explain nessler's reagent.
 - 2.3 Explain the determination of temporary hardness of water.
 - 2.4 Explain the determination of permanent hardness of water.
 - 2.5 Describe the Arsenic test of water.
 - 2.6 Solve the problems on hardness of water.

PIGMENTS

- 3 Understand the aspects of pigment manufacturing.**
 - 3.1 Define pigments.
 - 3.2 Mention the color of 10 pigments.
 - 3.3 Explain the manufacturing of white pigment (white lead and zinc oxide).
 - 3.4 Explain the manufacturing of ultramarine.
 - 3.5 Explain the manufacturing of carbon black.
 - 3.6 Explain the manufacturing of litho phone.
 - 3.7 Explain the manufacturing of red lead.
 - 3.8 Explain the manufacturing of chrome green.

PAINTS

- 4 Understand the aspects of paint manufacturing.**
 - 4.1 Define paint.
 - 4.2 Mention the required properties of a good paint.

- 4.3 Explain the meaning of pigment.
- 4.4 List the constituents of paint.
- 4.5 Mention the functions of the paint constituents.
- 4.6 Explain the general method of manufacture of paint.
- 4.7 Outline the importance of pigment volume concentration in paint industries.

VARNISHES

5 Understand the aspects of varnishes, enamels and lacquers manufacturing.

- 5.1 State the meaning of varnishes, enamels and lacquers.
- 5.2 List the raw materials used for the manufacturing of varnishes.
- 5.3 Mention the uses of varnishes.
- 5.4 Explain the manufacturing of enamels.
- 5.5 List the constituents of lacquers.
- 5.6 Explain the manufacturing of lacquer.
- 5.7 Mention the uses of lacquer.

OILS, FATS AND WAXES

6. Understand Oil, fat and waxe.

- 6.1 Describe historical background of oils, fats and waxes.
- 6.2 Describe industrial uses of oils, fats and waxes.
- 6.3 Describe the role of oils fats and waxes in economics.
- 6.4 Define oil and fat.
- 6.5 Define edible oil, vegetable oil & animal oil.
- 6.6 Classify the oils and fats.

7. Understand the vegetable and animal oils.

- 7.1 Define vegetable oil.
- 7.2 Make a list of important vegetable oils.
- 7.3 Describe oil extraction from cotton seed oil with flow sheet.
- 7.4 Describe the production of soybean oil from soybean seed by solvent extraction process.
- 7.5 Make a list of animal oils.
- 7.6 Describe the production of lard with flowchart.

8. Understand the refining of oils.

- 8.1 Define refining of oil.
- 8.2 Define bleaching of oil.
- 8.3 Define hydrogenation.
- 8.4 Define deodorizing of vegetable oils.
- 8.5 Describe the dry process of hydrogenation of oil.
- 8.6 Describe the refining of vegetable oil.
- 8.7 Describe the bleaching and deodorizing of vegetable oils.
- 8.8 Draw the flow chart for continuous processing of edible oil, either vegetable oil including bleaching hydrogenation and deodorizing.

9. Understand the waxes.

- 9.1 Define waxes.
- 9.2 List different types of waxes.
- 9.3 Describe uses and economical importance of waxes.
- 9.4 Explain bees wax, paraffin wax, synthetic wax, Chinese wax, wool wax and liquid wax.
- 9.5 Describe the production of bees wax and synthetic wax.

10. Understand the Tests of Fats and Oils.

- 10.1 Describe the determination of Saponification value of fats and oils.
- 10.2 Describe the determination of acid value of fats and oils.

- 10.3 Describe the determination of Iodine value of fats and oils.
- 10.4 Describe the determination of Reichert Meissl (RM) value of fats and oils.

LEATHER PROCESSING

11. Understand the aspects leather processing.

- 11.1 Define tanning.
- 11.2 Explain the vegetable tanning process for the manufacture of finished leather.
- 11.3 Explain the chrome tanning process with flow chart for the manufacturing of finished leather.
- 11.4 Define glue and gelatine.
- 11.5 Explain manufacturing of glue.
- 11.6 Explain the manufacturing of gelatine.

TEXTILE PROCESSING

12. Understand basic idea of wet process, singeing, de-sizing and scouring.

- 12.1 Define wet process.
- 12.2 Classify wet process system.
- 12.3 Mention the flow-chart of wet process for yarn.
- 12.4 Define singeing and de-sizing.
- 12.5 Mention the purposes of singeing.
- 12.6 Define scouring.
- 12.7 Mention the purpose of scouring.

13. Understand basic idea of dyeing, printing & finishing.

- 13.1 Define colour, dye & dyeing.
- 13.2 Mention the purpose of dyeing.
- 13.3 List the commercially important dyes with their commercial names.
- 13.4 Describe the general idea of dyeing.
- 13.5 Define the printing.
- 13.6 Mention the purposes of printing.
- 13.7 List the methods of printing.
- 13.8 Describe general idea of printing.
- 13.9 Explain general idea of Textile finishing.

Practical :

- 1. Determine the temporary hardness of water.
- 2. Determine the permanent hardness of water.
- 3. Treat the hard water by lime-soda process.
- 4. Treat the drinking water by reverse osmosis process.
- 5. Determine the saponification value of oils and fats.
- 6. Determine the Acid value of supplied sample of oils and fats.
- 7. Determine the Iodine value of supplied sample of oil and fat.
- 8. Draw a flow chart of production of soybean oil from soybean seed.
- 9. Draw a flow chart of hydrogenation of oil of dry process.
- 10. Determine the melting point of a hydrogenated product (dalda) by using hot water bath.
- 11. Prepare the wood varnish.
- 12. Visit at least two related industry and submit a report on it.

REFERENCE BOOKS

- 1 Shreve's Chemical Process Industries
– George T. Austin
- 2 Dryden's Outlines of Chemical Technology
– M. Gopala Rao and Marshall Sittig
- 3 Industrial Chemistry (Vol I & II)
– R.K. Das
- 4 Modern Applied Chemistry
– A.N. Zamre, V.G. Ratolikar
5. Industrial chemistry-
- B.K.Sharma.
6. Textile of tex processing vol-1
- Dr. V.A. Shenai.
7. শিল্প রসায়ন ও রাসায়নিক প্রযুক্তি
- ডঃ এ, এস, এম, নূরুল হক ভূঁইয়া।
8. তাঁত ও রং
- টি.এন.বসু.

6745 ELECTRICAL CIRCUITS AND MACHINES

T	P	C
2	3	3

AIMS

- To provide understanding and skill on AC circuits.
- To develop concept on polyphase system.
- To familiarize with the construction and operating principle of transformer.
- To develop understanding on the principles of DC motor.
- To develop knowledge and skill on 3-phase and 1-phase induction motor.
- To develop understanding on the principle of synchronous motor.

SHORT DESCRIPTION

Complex algebra – application to AC circuits; RLC series and parallel circuits; Polyphase system; Star and delta connection; Transformer; Rotating electrical machines; DC motor; 3-phase induction motor; 1-phase induction motor; Synchronous motor and stepper motor.

DETAIL DESCRIPTION

Theory :

- 1 **Apply the Principle of Vector and Vector Quantities.**
 - 1.1 Define Vector Quantities.
 - 1.2 Explain the Vector representation of alternating voltage and current.
 - 1.3 Explain the Vector in polar and rectangular form.
 - 1.4 Formulate the relation between Vectors Expressed in rectangular and polar co-ordinate.
 - 1.5 Solve problems related to Vector sum and difference, multiplication and division.
- 2 **Apply the concept of AC series circuit containing resistor, Inductor and Capacitor.**
 - 2.1 Draw the circuit containing resistor, Inductor and Capacitor.
 - 2.2 Draw the Vector diagram RLC series circuit.
 - 2.3 Compute the results of RLC series circuit in cartesian form and polar form notation.
 - 2.4 Solve problems of RLC series circuit in rectangular co-ordinate system and polar co-ordinate system.
 - 2.5 Draw the circuit containing resistor, Inductor and Capacitor In parallel.

- 2.6 Draw the Vector diagram of RLC parallel circuit.
- 2.7 compute the results of parallel AC circuit in cartesian form and polar form notation.
- 2.8 Solve problems on parallel Ac circuit in cartesian form and polar form notation.

3 Understand the application of complex algebra for power calculation.

- 3.1 Calculate power employing complex form.
- 3.2 Calculate VAR employing complex form.
- 3.3 Describe the conjugate method of calculating real power.
- 3.4 Describe the conjugate method of calculating reactive power.

POLYPHASE SYSTEM

4 Understand the concept of poly-phase system.

- 4.1 State the term poly-phase system.
- 4.2 List the advantages of poly-phase system over single phase system.
- 4.3 State the generation of poly-phase emf.
- 4.4 Sketch the phase voltage wave diagram.
- 4.5 Identify the phase sequence of poly-phase system.
- 4.6 State the effects of reverse phase sequence.
- 4.7 Explain the methods of checking phase sequence.
- 4.8 Sketch the phase sequence diagram of 3-phase voltage.

5 Apply the concept of polyphase for interconnection.

- 5.1 Write down possible ways of interconnection of three phase system.
- 5.2 Draw the circuit diagram of star connected 3-phase, 3-wire system.
- 5.3 List the application of 3-phase, 3-wire, star connected system.
- 5.4 Sketch 3-phase, 4-wire, star connection system.
- 5.5 List application of 3-phase, 4-wire star connection system.
- 5.6 Draw the vector diagram of 3-phase, 4-wire, star connection system.
- 5.7 Interpret the relation between line and phase voltage and current in a balanced 3-phase, 3-wire, star connection system.
- 5.8 Simplify the relation between line and phase voltage and current in a balanced 3-phase, 4-wire star connection system.

6 Understand the function of 3-phase star connection system.

- 6.1 Define Balance and Unbalance System
- 6.2 Identify neutral wire in a 3-phase star connection system.
- 6.3 Evaluate the current in the neutral wire in an unbalanced 3-phase, 4-wire, star connected system.
- 6.4 Draw the phasor diagram of 3-phase, 4-wire star connected system.
- 6.5 Discuss the formula $I_L = I_P$ and $V_L = \sqrt{3} V_P$
- 6.6 Calculate volt-ampere, power and power factor in a balanced 3-phase, 4-wire star connected system.
- 6.7 Solve problems on star connected (balanced and unbalanced) power system.

7 Understand the features of 3-phase delta connection system.

- 7.1 Draw the circuit diagram of a 3-phase delta connected system.
- 7.2 Draw the phasor diagram of delta connected system.
- 7.3 Express the deduction of the formula $V_L = V_P$ and $I_L = \sqrt{3} I_P$ for connected system.
- 7.4 Simplify the relation between line and phase current & voltage in a balanced delta connected system.
- 7.5 Calculate the volt-ampere, power and power factor in a balanced 3-phase, delta connected system.
- 7.6 Solve problems on delta connected balanced system.
- 7.7 Compare the advantages of star connected system with those of delta connected system.

TRANSFORMER

8 Understand the principle of operation of transformer.

- 8.1 Define transformer.

- 8.2 Explain the working principle of transformer.
- 8.3 Explain the emf equation of a transformer.
- 8.4 Explain no load operation of transformer.
- 8.5 Explain operation of transformer at load condition.
- 8.6 Solve problems related.

9 Understand the constructional features of transformer.

- 9.1 Describe the constructional features of transformer.
- 9.2 Identify different types of transformer.
- 9.3 List the uses of transformer.
- 9.4 Explain transformation ratio (voltage, current and turns).
- 9.5 Solve problems on transformation ratio.

10 Understand the concept of losses, efficiency and voltage regulation of transformer.

- 10.1 Explain different losses in transformer.
- 10.2 Explain the factors affecting core loss and copper loss.
- 10.3 Explain the equation for maximum efficiency.
- 10.4 Explain the open circuit test and short circuit test of a transformer.
- 10.5 Solve problems on efficiency and maximum efficiency.
- 10.6 Explain the equation for voltage regulation of transformer.
- 10.7 Solve problems on voltage regulation of transformer.

DC MOTOR

11 Understand the principle of DC motor.

- 11.1 Explain the working principle of DC motor.
- 11.2 Explain generator action of motor.
- 11.3 Explain the term torque, running torque and break down torque.
- 11.4 Explain the torque equation of motor.
- 11.5 Describe the constructional features of DC motor.
- 11.6 Explain the function of commutator.

12 Understand the characteristics of DC motor.

- 12.1 Identify different types of DC motor.
- 12.2 Explain the performance characteristics of different types of DC motor.
- 12.3 Describe starting methods of DC motor.
- 12.4 Describe speed control of DC motor.

INDUCTION MOTOR

13 Understand the principle of induction motor.

- 13.1 Explain the general principle of induction motor.
- 13.2 Distinguish between the principles of induction motor and conduction motor.
- 13.3 Define slip and synchronous speed.
- 13.4 Identify the types of induction motor.
- 13.5 List the uses of induction motor.

THREE-PHASE INDUCTION MOTOR

14 Understand the working principle of 3-phase induction motor.

- 14.1 Explain the construction of 3-phase induction motor.
- 14.2 Explain the construction of a 3 phase squirrel case induction motor.
- 14.3 Explain the construction of a 3 phase wound rotor induction motor.
- 14.4 State the production of rotating magnetic field in a 3-phase induction motor.
- 14.5 Describe the methods of starting 3-phase induction motor.
- 14.6 State the principles of speed control of 3-phase induction motor.

SINGLE-PHASE INDUCTION MOTOR

15 Understand the working principle of 1-phase induction motor.

- 15.1 Explain working principle of 1-phase induction motor.
- 15.2 Explain the self starting method of single phase motor.
- 15.3 Describe the principles of operation of standard split phase motor.

- 15.4 Describe the principles of operation of capacitor motor.
- 15.5 Describe the principles of operation of shaded pole motor and repulsion motor.
- 15.6 Identify hysteresis motor, universal motor, reluctance motor and AC series motor.
- 15.7 Mention the methods of speed control of single phase induction motor.

SPECIAL MOTORS

16 Understand the working principle of synchronous motor and Stepper motor.

- 16.1 Explain the principle of operation of synchronous motor.
- 16.2 Describe the constructional features of synchronous motor.
- 16.3 Describe the starting methods of synchronous motor.
- 16.4 Explain the working principle of stepper motor.
- 16.5 List the different types of stepper motor.
- 16.6 Describe construction of different stepper motors.

Practical :

1 Determine the value of resistance, inductance & capacitance and draw vector diagram of RLC series circuit.

- 1.1 Sketch the circuit diagram for RLC series circuit.
- 1.2 Select equipment, tools & materials for the experiment.
- 1.3 Connect the circuit according to the circuit diagram.
- 1.4 Check all connection points before energizing the circuit.
- 1.5 Record the readings from the meter connecting power supply to the circuit.
- 1.6 Find the values of resistance, inductance, capacitance and phase angle from the relevant data.
- 1.7 Verify the impressed voltage is equal to the vector sum of voltage drops in each parameter.
- 1.8 Sketch the vector diagram with the help of relevant data as obtained.

2 Determine the values of resistance, inductance, capacitance and draw the vector diagram of RLC parallel circuit.

- 2.1 Sketch the circuit diagram for RLC parallel circuit.
- 2.2 Select equipment, tools & materials for the experiment.
- 2.3 Connect the circuit according to the circuit diagram.
- 2.4 Check all connection points before energize the circuit.
- 2.5 Record the readings from the meter connecting power supply to the circuit.
- 2.6 Find the value of resistance, inductance, capacitance and phase angle from the relevant data.
- 2.7 Verify the line current is equal to the vector sum of branch currents.
- 2.8 Sketch the vector diagram with the relevant data as obtained.

3 Demonstrate poly-phase power system and identify phase sequence.

- 3.1 Sketch the circuit diagram of a poly-phase power system showing phase sequence.
- 3.2 Select equipment, tools & materials for the experiment.
- 3.3 Study and connect the poly-phase system.
- 3.4 Observe the voltages by voltmeter.
- 3.5 Observe the phase voltages by oscilloscope.
- 3.6 Compute phase sequence.

4 Measure line and phase voltage & current in a 3-phase star connected inductive load.

- 4.1 Sketch the circuit diagram for 3-phase star connected load.
- 4.2 Select equipment, tools & materials for the experiment.
- 4.3 Connect the circuit according to the circuit diagram
- 4.4 Check all connection points before connecting power supply.
- 4.5 Record the readings of instruments.
- 4.6 Compare the recorded values with calculated values.
- 4.7 Note down the observations remarks.

5 Measure line and phase current & voltage in 3-phase delta connected inductive load.

- 5.1 Sketch the circuit diagram for 3-phase delta connected load.

- 5.2 Select equipment, tools & materials for the experiment.
- 5.3 Connect the circuit according to the circuit diagram.
- 5.4 Check all connection points before connecting power supply.
- 5.5 Record the readings of the instruments.
- 5.6 Compare the recorded values with calculated values.
- 5.7 Note down the observations.

6 Measure current, voltage and power in a balanced 3-phase star connected inductive load and construction of vector diagram.

- 6.1 Sketch the circuit diagram for measuring power by 3 watt meters of a 3-phase system.
- 6.2 Select equipment, tools & materials for the experiment.
- 6.3 Connect the circuit according to the circuit diagram.
- 6.4 Check all connection points and equipment & instruments before actual operation.
- 6.5 Record the readings from the meters in the circuit.
- 6.6 Calculate the power from the formula
 $P_t = W_1 + W_2 + W_3$ and $3V_p I_p \cos \theta$
- 6.7 Draw the vector diagram using relevant data as obtained.
- 6.8 Note down the observations.

7 Measure current, voltage and power in a balanced 3-phase delta connected inductive load and construction of vector diagram.

- 7.1 Draw the circuit diagram for measuring power by 3-watt meter method of 3-phase delta connected load.
- 7.2 Select equipment, tools & materials for the experiment.
- 7.3 Connect the circuit according to the circuit diagram.
- 7.4 Check all connections, equipment and instruments before actual operation.
- 7.5 Record the reading from the meters used in the circuit.
- 7.6 Calculate the power from the formula
 $P_t = W_1 + W_2 + W_3$ and $P_t = \sqrt{3} V_{LL} I_{LL} \cos \theta$
- 7.7 Draw the vector diagram using obtained data.
- 7.8 Note down the observations.

8 Find the transformation ratio of a transformer.

- 8.1 Develop a circuit to perform the experiment.
- 8.2 Select required equipment and materials.
- 8.3 Connect the components according to the circuit diagram.
- 8.4 Check the connections.
- 8.5 Record the primary (E_p) and secondary (E_s) voltages.
- 8.6 Calculate the transformation ratio using the relation

$$\frac{E_s}{E_p} = \frac{N_s}{N_p} = K$$
- 8.7 Note down the observations.

9 Perform open circuit test of a single phase transformer.

- 9.1 Select the circuit diagram for the experiment.
- 9.2 Select required, equipment, tools and materials.
- 9.3 Connect all the equipment according to the circuit diagram.
- 9.4 Connect the low side to its rated voltage to the power supply keeping high side open.
- 9.5 Record instrument readings.
- 9.6 Calculate required data.
- 9.7 Draw no load vector diagram with the data obtained.
- 9.8 Note down the observations.

10 Perform short circuit test of a single phase transformer.

- 10.1 Select the required circuit diagram for the experiment.
- 10.2 Select required, equipment, tools and materials.
- 10.3 Connect the equipment according to the circuit diagram.
- 10.4 Energize the circuit by applying reduced voltage.

- 10.5 Record copper loss and calculate R'_e , X'_e and Z'_e .
- 10.6 Note down the observations.

11 Construct load versus speed characteristic curve of DC shunt motor.

- 11.1 Draw the required circuit diagram for the experiment.
- 11.2 Select the instrument and materials required.
- 11.3 Connect all the instrument's according to diagram.
- 11.4 Take the necessary data from the connected instruments.
- 11.5 Draw the required curve.
- 11.6 Note down the observations.

12 Study the components/parts of a 3-phase induction motor.

- 12.1 Prepare a list of the parts of a 3-phase induction motor.
- 12.2 Dismantle the components/parts of the motor.
- 12.3 Develop sketches of each part.
- 12.4 Sketch the developed diagram of the windings of the motor.
- 12.5 Assemble the dismantled parts.
- 12.6 Note down the observations.

13 Operate a 3-phase induction motor.

- 13.1 Sketch the circuit diagram.
- 13.2 Select required, equipment, tools and materials.
- 13.3 Connect starter with motor.
- 13.4 Connect power supply to the circuit.
- 13.5 Observe the operation.
- 13.6 Measure the speed of the rotor.
- 13.7 Note down the observations.

14 Start a 1-phase capacitor type motor/ceiling fan with regulator.

- 14.1 Select the equipment and tools required for the experiment.
- 14.2 Sketch a working diagram.
- 14.3 Identify the two sets of coils.
- 14.4 Connect the capacitor with the proper set of coil.
- 14.5 Connect power supply to the fan motor.
- 14.6 Test the rotation of the motor opposite direction by changing the capacitor connection.
- 14.7 Note down the observations.

15 Operate a synchronous motor by changing field excitation.

- 15.1 Select required equipment, tools, machine and materials.
- 15.2 Sketch the circuit diagram.
- 15.3 Connect the instrument according to the diagram.
- 15.4 Check the circuit.
- 15.5 Change the field excitation.
- 15.6 Record armature and field current.
- 15.7 Draw the 'V' curve.
- 15.8 Note down the observations.

REFERENCE BOOKS

1. Electrical Technology – B. L. Theraja
2. Electrical Machine – Siskind

- To provide understanding and skill on SCR and TRIAC.
- To provide understanding and skill on phase controlled rectifier.
- To provide understanding and skill on wave shaping circuits.
- To familiarize with integrated circuits.
- To give an understanding on the Operational Amplifier.
- To develop comprehensive knowledge and skill on power switching device.
- To provide understanding and skill on optoelectronic device and security system.
- To provide understanding and skill on special electronic equipment.
- To familiarize with the programmable logic controller.

SHORT DESCRIPTION

UJT, SCR, PUT, DIAC, TRIAC, controlled rectifier, wave shaping circuits, integrated circuit, Operational amplifier, Power switching devices; Optoelectronic device; Security system; Special electronic equipment and Programmable logic controller.

DETAIL DESCRIPTION

Theory:

1. Understand the Concept of Unijunction Transistor (UJT).
 - 1.1 Describe the structure and operation of UJT.
 - 1.2 Identify the UJT by its equivalent circuit.
 - 1.3 Define standoff ratio.
 - 1.4 Explain why UJT is not a thyristor.
 - 1.5 Analyze the operation of a UJT relaxation oscillator.
 - 1.6 Analyze the operation of UJT controlled SCR dc operated time-delay circuit.

2. Understand the Concept of Silicon Control Rectifier (SCR)
 - 2.1 Define Thyristors.
 - 2.2 Mention the types of Thyristors.
 - 2.3 Describe the construction and operation of SCR.
 - 2.4 Describe the I-V characteristics of SCR.
 - 2.5 Explain the operation of SCR using two-transistor Equivalent circuit.
 - 2.6 Derive the equation for anode current.
 - 2.7 Explain how to turn an SCR on and off.
 - 2.8 Define various parameters and mention the ratings of SCR.
 - 2.9 Explain the operation of automatic battery charger, emergency lighting.
 - 2.10 System, heater control, and over voltage protection circuits.
 - 2.11 Mention the advantages of SCR as a switch.
 - 2.12 Describe the construction and operation of light activated SCR (LASCR).

3 Understand the Concept of Controlled Rectifier.

- 3.1 Define Controlled Rectifier.
- 3.2 Mention the types of control rectifier.
- 3.3 Describe the operation of half wave controlled rectifier using SCR for resistive and inductive load with wave shapes.
- 3.4 Drive the equation for load current and voltage of half wave controlled rectifier for resistive and inductive load.
- 3.5 Analyze the operation of single-phase full-wave mid-point controlled rectifier, Half controlled and full controlled bridge rectifier with wave shapes.
- 3.6 Drive the equation for load current and voltage of full wave rectifier.
- 3.7 Explain the effect of freewheeling diode in rectifier circuit with inductive load.
- 3.8 Describe the operation of poly-phase controlled rectifier.
- 3.9 Mention the operation of (a) Illumination circuit (b) Speed control of dc and ac motors.

4 Understand the Concept of Programmable Unijunction Transistor (PUT)

- 4.1 Describe the structure and operation of the PUT.
- 4.2 State how to set the trigger voltage of PUT.
- 4.3 Explain the difference between a PUT and UJT.
- 4.4 Analyze the operation of a PUT relaxation oscillator.

5. Understand the Concept of DIAC and TRIAC

- 5.1 Describe the structure and operation of DIAC.
- 5.2 Explain the I-V characteristics curve of DIAC.
- 5.3 Describe the structure of TRIAC.
- 5.4 Discuss the SCR equivalent circuit of TRIAC.
- 5.5 Explain the triggering modes of TRIAC.
- 5.6 Describe the characteristics curve of TRIAC.
- 5.7 State the commutation of TRIAC.
- 5.8 Analyze the operation of TRIAC firing circuits using (i) DIAC (ii) UJT.
- 5.9 Analyze the operation of a TRIAC phase control, lamp dimmer and Heat control circuit.

6. Understand the features of wave shaping circuits.

- 6.1 Mention the types of wave shaping circuit.
- 6.2 Discuss the principles of RC and RL differentiating and integrating circuits.
- 6.3 Analyze the output waves for various input wave shapes of differentiating and integrating circuit.
- 6.4 Explain the operation of various clippers by PN junction diode, zener diode and transistor.
- 6.5 Describe the operation of diode clamping circuit for different input wave shape.

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 circuits.
 - 7.5 Describe the fabrication monolithic integrated circuits.
 - 7.6 Describe the fabrication of integrated circuit components resistor, capacitor BJT and FET.

8. Understand the Features of Operational Amplifier (Op- Amp)
 - 8.1 Define operational amplifier.
 - 8.2 Recognize the Op-Amp symbol.
 - 8.3 Identify the terminals on Op-Amp packages.
 - 8.4 State the basic principle of Op-Amp.
 - 8.5 Analyze the equivalent circuit of Op-Amp.
 - 8.6 State the golden rule and virtual ground of Op-Amp.
 - 8.7 List the characteristics of an ideal Op-Amp.
 - 8.8 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.
 - 8.9 Explain the operation of Op-Amp in inverter, scale changer, unity follower, comparator, phase shifter, adder, subtractor, differentiator, integrator, ramp generator, multichannel amplifier and filters.

9. Understand the feature of advance power switching devices
 - 9.1 Describe the construction of GTO, IGBT, MCT, SIT and SITH & LASCR.
 - 9.2 Explain the principles of operation of GTO, IGBT, MCT, SIT and SITH & LASCR.
 - 9.3 Mention the v-i characteristics of GTO, IGBT, MCT, SIT and SITH &LASCR devices.
 - 9.4 List the application of various power switching devices.

10. Understand the features of photo resistors, photo diodes and phototransistors.
 - 10.1 Describe the basic structure of photo resistors, photo diodes & photo transistors.
 - 10.2 Explain the operating principles of photo resistors, photo diodes & photo transistors.
 - 10.3 Explain the v-i characteristics curve of photo resistors, photo diodes and photo transistors.
 - 10.4 List typical applications of photo resistors, photo diodes and photo transistors.

- 10.5 Explain a block diagram showing how photo detectors used in speed measuring system.
- 10.6 Explain the operation of photo diode switching circuit.
- 10.7 Explain the operation of photo transistor switching circuit.
- 11. Understand the features of security system.
 - 11.1 Explain the operation fire (smoke) indication system using ionization detector and photo transistor with block diagram.
 - 11.2
 - 11.3 Describe the operation of touch and non-touch type person (thief) detector using Infrared detection system with block diagram.
 - 11.4 Explain the operation of video monitoring system using video camera and video monitor (With multiple monitor switching).
- 12. Understand the features of special electronic equipment.
 - 12.1 Mention the principles of operation of UPS with block diagram.
 - 12.2 Mention the principles of operation of SMPS with block diagram.
 - 12.3 Mention the principles of operation of multimedia projector with block diagram.
- 13. Understand the features of programmable logic controllers (PLCs).
 - 13.1 Mention the basic operating and programming principles of PLCs.
 - 13.2 Draw a simplified block diagram showing the main parts of a PLC.
 - 13.3 State the function of main part of PLC.

Practical:

- 1 Determine the characteristics curve of UJT.**
 - 1.1 Select an appropriate experiment circuit, required materials, tools and equipments.
 - 1.2 Connect the circuit as per diagram with meters.
 - 1.3 Check the circuit and switch on the power supply.
 - 1.4 Record the data for I-V curve.
 - 1.5 Plot the curve.
- 2 Study the gate control of forward breakdown voltage for an SCR.**
 - 2.1 Select an appropriate circuit, required tools, equipments and materials.
 - 2.2 Connect the circuit as per diagram with meters.
 - 2.3 Switch on the power supply and make proper adjustments.
 - 2.4 Set the gate control at minimum and observe the breakdown voltage for I-V characteristics.
 - 2.5 Increase gate current in steps and observe the breakdown voltage.
 - 2.6 Plot the I-V characteristics curve.
 - 2.7 Compare different curves and breakdown voltage.
- 3 Study the Operation of a single phase controlled rectifier using SCR.**
 - 3.1 Select an appropriate experiment circuit.
 - 3.2 Select required tools, equipments and materials.

- 3.3 Connect the circuit as per diagram with Oscilloscope.
- 3.4 Check the connection and switch on the power supply.
- 3.5 Observe the wave shapes at relevant points of the circuit.

4 Study the Operation of a Illumination Circuit.

- 4.1 Select an appropriate experiment circuit.
- 4.2 Select required tools, equipments and materials.
- 4.3 Connect the circuit as per diagram.
- 4.4 Check the connection and switch on the power supply.
- 4.5 Adjust the POT and observe the Illumination.

5 Determine the characteristics curve of DIAC.

- 5.1 Select an appropriate experiment circuit, required materials, tools and equipments.
- 5.2 Connect the circuit as per diagram with meters.
- 5.3 Check the circuit and switch on the power supply.
- 5.4 Record the data for I-V curve.
- 5.5 Plot the curve.

6 Study the Operation of a RC differentiating circuit.

- 6.1 Select a RC differentiating circuit.
- 6.2 Select required materials, tools and equipments.
- 6.3 Connect the circuit as per diagram with CRO.
- 6.4 Switch on the power supply.
- 6.5 Adjust the signal frequency for the differentiating circuit.
- 6.6 Observe the output wave for different input wave shape on CRO screen.

7 Study the Operation of a RC Integrating circuit.

- 7.1 Select a RC differentiating circuit.
- 7.2 Select required materials, tools and equipments.
- 7.3 Connect the circuit as per diagram with CRO.
- 7.4 Switch on the power supply.
- 7.5 Adjust the signal frequency for the differentiating circuit.
- 7.6 Observe the output wave for different input wave shape on CRO screen.

8 Study the operation of biased and unbiased series and shunt clipping circuits for positive and negative peak and bias clipping of a sine wave using switching diodes.

- 8.1 Select a required circuit.
- 8.2 Select the associate equipments and materials.
- 8.3 Buildup the circuit for required wave shapes.
- 8.4 Switch on the power supply.
- 8.5 Observe the output on CRO screen.

9 Study the operation a clamping circuit.

- 9.1 Select a required circuit.
- 9.2 Select the associate equipments and materials.
- 9.3 Buildup the circuit for required wave shapes.
- 9.4 Switch on the power supply.
- 9.5 Observe the output on CRO screen.

10 Study the operation of Op-Amp (for IC 741) as inverting and non inverting amplifier, adder, comparator, buffer and subtractor.

- 10.1 Select a required circuit.
- 10.2 Select the associate equipments and materials.

- 10.3 Buildup the circuit as per function.
- 10.4 Switch on the power supply.
- 10.5 Observe the input and output wave shape on CRO screen.

11 Study the operation and application of SMPS./UPS

- 11.1 Select a SMPS/UPS
- 11.2 Identify different parts of SMPS/UPS
- 11.3 Observe the operation of SMPS/UPS

12 Determine the v-i characteristic curve of photo diode.

- 12.1 Select a required circuit.
- 12.2 Select tools and materials.
- 12.3 Build up the circuit
- 12.4 Check the connection.
- 12.5 Switch on the power supply
- 12.6 Record the data.
- 12.7 Plot the curve.

13 Study the operation of PLC.

- 13.1 Select a PLC trainer.
- 13.2 Identify different parts of turner
- 13.3 Observe the operation of PLC for specific purpose.

REFERENCES:

1. Electronic Device and Circuit Theory
 - Robert L. Boylestad, Louis Nashelsky
2. Electronic Devices
 - Floyd
3. Power Electronics
 - Dr. P.S. Bimbhra
4. Principles of Electronics
5. A Text Book of Applied Electronics
 - R. S. Sedha

7042	MACHINE SHOP PRACTICE	T	P	C
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OBJECTIVES

- To enable recognize commonly used machine tools.
- To provide understanding the functions of commonly used machine tools.
- To develop skills in setting up and operating of machine tools.
- To provide concept of using Coolant in machining.
- To provide ability to set and operate commonly used allied tools and accessories.
- To provide understanding the operation of Milling Machine.

SHORT DESCRIPTION

Machine tools: Lathe machine; Drilling machine; Shaper; Grinding machine; Milling Machine; Measuring techniques.

DETAIL DESCRIPTION

Theory :

- 1 Understand the concept of machine tools.**
 - 1.1 State what is meant by machine tools.
 - 1.2 Classify commonly used machine tools.
 - 1.3 State general safety precautions to be observed in machine shop.

- 2 Understand the application of Lathe machine.**
 - 2.1 Identify different types of lathe machines.
 - 2.2 Identify major components of lathe machine.
 - 2.3 Explain the function of different parts and attachments of lathe machine.
 - 2.4 Carry out basic calculations for speed and feed for lathe works.
 - 2.5 State safety precautions during working on a lathe.
 - 2.6 Identify single point cutting tools, tool materials, cutting angles and their relevant functions.

- 3. Understand the application of Coolant in machining operation.**
 - 3.1 Explain the necessity of coolant in machining.
 - 3.2 Identify different types of coolant.
 - 3.3 Describe the use of various types of coolant.

- 4. Understand the application of drilling machine.**
 - 4.1 Identify different types of drilling machine.
 - 4.2 Explain the function of different drilling machines.
 - 4.3 Identify major components of drilling machine.
 - 4.4 Illustrate workholding methods.
 - 4.5 Carry out basic calculations for speed and feed.
 - 4.6 State safety precautions during working on a drilling machine.
 - 4.7 Identify different types of twist drill, tool materials, cutting angles and their relevant functions.

- 5. Understand the application of shaper.**
 - 5.1 Identify the shaping machines.
 - 5.2 Identify major components of shaping machine.
 - 5.3 Describe the quick return mechanism and ram adjustments.
 - 5.4 Explain how to set a workpiece on the machine table of shaper.
 - 5.5 Identify typical operations for shaper.
 - 5.6 State safety precautions during working on the shaper.

- 6 Understand the application of grinding machine.**
 - 6.1 Identify different types of grinding machines.
 - 6.2 Distinguish surface grinder, cylindrical grinder and pedestal/bench grinder.
 - 6.3 Explain the need for grinding wheel balancing.
 - 6.4 Identify typical operations for the pedestal and surface grinder.
 - 6.5 State safety precautions during working on grinding machine.
 - 6.6 Identify grinding wheel types, bonds and uses.

- 7 Understand the features of milling machine.**
 - 7.1 State the meaning of Milling.
 - 7.2 Identify different types of milling machine.
 - 7.3 Identify the principal parts of a milling machine.
 - 7.4 Distinguish among plain, universal, and vertical milling machine.
 - 7.5 Identify the various kinds of milling cutter.
 - 7.6 Mention the use of various milling cutter.
 - 7.7 State safety precautions during working on milling machine.
 - 7.8 Mention the care and maintenance of milling cutters.

Practical :

- 1 Demonstrate the setting and operating of lathe machine.**
 - 1.1 Perform simple setting up of machine, workpiece, tool bit and setting machine speed and feed.
 - 1.2 Carry out machining operations for facing, parallel turning, center drilling.
 - 1.3 Produce a job to an engineering drawing specification.
 - 1.4 Carry out additional machining operations of knurling, taper turning, drilling, parting off, simple screw cutting and boring.
 - 1.5 Sharpen a number of commonly used single point cutting tools using pedestal grinder.
 - 1.6 Observe workshop safety precautions.
- 2 Demonstrate the setting and operating of shaping machine.**
 - 2.1 Perform simple setting up of machine, workpiece, tool bit, speed and feeds, ram position and stroke.
 - 2.2 Carry out machining operation for parallel shaping and vertical face shaping.
 - 2.3 Produce a simple job to an engineering drawing specification.
 - 2.4 Observe workshop safety precautions.
- 3 Demonstrate the setting and operating of a drilling machine.**
 - 3.1 Perform simple setting up of machine, workpiece, drill bit, speeds and feeds.
 - 3.2 Sharpen a twist drill on the pedestal grinder.
 - 3.3 Drill a number of holes with appropriate drill bit.
 - 3.4 Observe workshop safety precautions.
- 4 Demonstrate the setting and operating of a grinding machine.**
 - 4.1 Determine type of wheel, grit, bond, balance and soundness by ringing.
 - 4.2 Mount grinding wheel on machine spindle.
 - 4.3 Use the pedestal grinder to grind single point tools and drill bits.
 - 4.4 Perform simple setting up of surface grinding machine workpiece, magnetic chuck, hydraulic system of machine feed.
 - 4.5 Produce a job to an engineering drawing specification.
 - 4.6 Observe ground surface finish, grain direction, bouncing of wheel.
 - 4.7 Carry out wheel dressing exercise on both pedestal grinder and surface grinder.
 - 4.8 Observe workshop safety precautions.
- 5 Demonstrate workshop maintenance practice.**
 - 5.1 Produce a maintenance schedule common used in machine shop.
 - 5.2 Carry out simple maintenance procedures, including lubrication.
 - 5.3 Observe workshop safety precautions.
- 6 Milling machine setting and operation.**
 - 6.1 Set up the machine vice and hold workpiece to produce a flat surface using a milling cutter.
 - 6.2 Produce the parallel and slotted workpiece using appropriate cutter.

REFERENCE BOOKS

- 1 Basic Machine Shop Practice I & II
— V. K. Tejwani
- 2 Workshop Technology I & II
— W. A. J Chapman
- 3 Machine Shop Practice I & II
— Berghardt
- 4 Machine Shop Practice
— Somenath De
- 5 Machine tool operation
— Anderson.

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 বিকশিতকরণ।

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**

- ইতিহাসের সংজ্ঞা, প্রাগৈতিহাসিক আমলের বাংলাদেশ এবং বাংলাদেশের আবহাওয়া ও অধিবাসী সম্পর্কে অবগত হওয়া।
 - ইতিহাসের সংজ্ঞা প্রদান।
 - বাংলাদেশের প্রাচীন জনপদ উল্লেখ করা।
 - বঙ্গ বা বাংলা নামের উৎপত্তি ব্যাখ্যা করা।
 - বঙ্গের সীমারেখা চিহ্নিত করা।
 - বাংলার আবহাওয়া ও এর অধিবাসীদের চরিত্রে আবহাওয়ার প্রভাব বিবৃত করা।
 - প্রাগৈতিহাসিক ও প্রাচীন বাংলার আর্থসামাজিক ব্যবস্থা বর্ণনা করা।
- বাংলাদেশে গুপ্ত, রাজা শশাঙ্ক, পাল ও মুসলিম শাসন সম্পর্কে অবগত হওয়া।
 - গুপ্ত শাসন আমলে বাংলার শাসনব্যবস্থা বর্ণনা করা।
 - রাজা শশাঙ্কের রাজ্য বিজয় ও শাসন বর্ণনা করা।
 - বাংলার অরাজকতা ও হিউয়েনসাং এর আমলে বাংলার অবস্থা বর্ণনা করা।
 - গোপাল কর্তৃক অরাজকতার অবসান ঘটানোর কৃতিত্বের বর্ণনা করা।
 - বাংলাদেশে মুসলমানদের আগমন ও বখতিয়ার খলজীর বাংলা বিজয় বর্ণনা করা।
 - বাংলাদেশে স্বাধীন সুলতানী শাসন প্রতিষ্ঠায় শামছুদ্দিন ইলিয়াশ শাঈরী কৃতিত্ব বর্ণনা করা।
 - বাংলায় মোঘল শাসনের ইতিবৃত্ত ব্যাখ্যা করা।
 - ১৭৫৭ সালের পলাশীর যুদ্ধের কারণ, ঘটনা ও ফলাফল বর্ণনা করা।
- পলাশীযুদ্ধ পরবর্তী অবস্থায় ইস্ট ইন্ডিয়া কোম্পানীর আধিপত্য বিস্তার সম্পর্কে জ্ঞাত হওয়া।
 - দেওয়ানী, দ্বৈতশাসন ও বাংলার দুর্ভিক্ষ বর্ণনা করা।
 - ইংরেজদের চিরস্থায়ী বন্দোবস্ত এবং এর ফলাফল বর্ণনা করা।
 - বাংলাদেশে জমিদার, প্রজাব্যবস্থা প্রতিষ্ঠা এবং আর্থ-সামাজিক ব্যবস্থায় জমিদারদের ভূমিকা ও প্রজাকুলের সার্বিক অবস্থা উল্লেখ করা।
 - ১৯০৫ সালের বঙ্গভঙ্গ আন্দোলন ও ফলাফল ব্যাখ্যা করা।
 - হাজী শরীয়ত উল্লাহর ফরায়েজী আন্দোলন ও এর ফলাফল ব্যাখ্যা করা।

৪. বঙ্গভঙ্গউত্তর রাজনীতি ও দেশ বিভাগ সম্পর্কে অবহিত হওয়া।

- ১৯৩৭ এর নির্বাচন ও এর বৈশিষ্ট্য উল্লেখ করা।

- ৪.২ লাহোর প্রস্তাব ব্যক্ত করা।
- ৪.৩ ১৯৪৩ এর বাংলার দুর্ভিক্ষের কারণ ও এর পূর্বাপর অবস্থা উল্লেখ 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 উল্লেখ 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 তমদুন মজলিসের ভূমিকা উল্লেখ করা।
- ৯.২ ১৯৫২ সালের ভাষা আন্দোলনের সাংস্কৃতিক গুরুত্ব উল্লেখ করা।
- ৯.৩ ঢাকা কেন্দ্রিক শিল্পী-সাহিত্যিকদের বাংলা সাংস্কৃতি বিনির্মাণের ভূমিকা পালন উল্লেখ করা।
- ৯.৪ '৬৯ এর গণ আন্দোলনে সাংস্কৃতিক কর্মীদের ভূমিকা উল্লেখ করা।
- ৯.৫ বাঙলা একাডেমীর প্রতিষ্ঠা এবং বাংলা ভাষা ও সাহিত্যে এর ভূমিকা উল্লেখ করা।
- ৯.৬ আন্তর্জাতিক মাতৃভাষা দিবস হিসেবে ২১ ফেব্রুয়ারির তাৎপর্য ব্যক্ত করা।
- ৯.৭ ভাষা, শিল্প সাহিত্য চর্চায় সংবাদপত্র ও ইলেকট্রনিক মিডিয়ার ভূমিকা উল্লেখ 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 দুগ্ধজাত মিষ্টান্ন 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 সাংস্কৃতিক অবদান ব্যাখ্যা করা।
- ১১.৩ বাংলাদেশের প্রাচীন সংস্কৃতির ঐতিহ্য হিসাবে মহাস্থানগড়, ময়নামতি ও পাহাড়পুরের প্রত্নতাত্ত্বিক নিদর্শনের বর্ণনা দান।

সহায়ক পুস্তক

রহিম, চৌধুরী, মাহমুদ ও ইসলাম, “বাংলাদেশের ইতিহাস (পরিবর্তিত ও পরিমার্জিত)” ; নওরোজ কিতাবিস্তান, আগস্ট, ১৯৯৯।

কে, আলী “বাংলাদেশের ইতিহাস”; আজিজিয়া বুক ডিপো, ২০০১।

সিরাজুল ইসলাম, “বাংলাদেশের ইতিহাস-১৭০৪-১৯৭১”; ১ম, ২য় ও ৩য় খণ্ড;

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কো-আল্‌ম্যানভা, প্রি, কতোভস্কি, “ভারতবর্ষের ইতিহাস”; প্রগতি প্রকাশন, ১৯৮৮।

গোপাল হালদার; “সংস্কৃতির রূপান্তর”; মুক্তধারা, মে ১৯৮৪।
 মোতাহের হোসেন চৌধুরী, “সংস্কৃতি কথা”; নওরোজ কিতাবিস্থান, জানুয়ারি ১৯৯৮।
 গোপাল হালদার, “বাংলা সাহিত্যের রূপরেখা-১ম ও ২য় খন্ড”; মুক্তধারা, জুলাই ১৯৭৮।

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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.