BANGLADESH TECHNICAL EDUCATION BOARD

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM

ELECTRICAL TECHNOLOGY

SYLLABUS

THIRD SEMESTER

ELECTRICAL TECHNOLOGY (67)
3rd Semester

Sl. No	Subject code	Name of the subject	T	P	C	MARKS				Total
						Theory		Practical		
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1	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	0	0	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	0	150
7	5811	Social Science-1	2	0	2	20	80	0	0	100
		Total	15	18	22					1100

6731   **ELECTRICAL CIRCUITS – II**

T	P	C
3	3	4

AIMS

- To provide knowledge and skill (to apply complex algebra) for the solution of AC circuits.
- To develop knowledge and skill on resonance by varying inductance, Capacitance and frequency.
- To develop concept on poly phase balanced power system.
- To acquire skill in measuring line and phase quantities in three phase supply.
- To assist in acquainting the concept of poly phase unbalanced power system.
- To develop the concept of non-sinusoidal waves.

SHORT DESCRIPTION

Complex algebra − application to AC circuits; RLC Parallel circuits; Expression for power and VAR;series resonance; Parallel resonance ; Poly phase system – 3-phase interconnection; Star connected system; Delta connected system; Balanced Power System; Unbalanced power system; Non-sinusoidal waves.

DETAIL DESCRIPTION

Theory :

1. Understand the application of complex algebra in RLC parallel circuit.

    1.1   Compute the value of parameters of RLC parallel circuit in rectangular form of notation and polar form of notation.

    1.2   Draw vector diagram of RLC parallel circuit.

    1.3   Solve problems on RLC parallel circuit.

    1.4   Solve problems on RLC series parallel AC circuit in rectangular form of notation and polar form of notation.

    1.5   Define admittance, susceptance and conductance.

    1.6   Mention the units of admittance, susceptance and conductance.

    1.7   Find the impedance, admittance, current and voltage in RLC parallel circuit.

    1.8   Draw impedance/admittance triangle of RLC parallel circuit.

    1.9   Solve problems on series parallel AC circuit in rectangular form of notation and polar form of notation.

2. Understand the concept of power calculation on AC circuit.
    2.1.   Express the calculation of power employing complex form.
    2.2.   Calculate VAR employing complex form.
    2.3.   Explain the conjugate method of calculating real & reactive power.
    2.4.   Sketch wave diagram for power of different AC circuits.

3. Understand the principle of resonance in series circuit.
    3.1   State resonance.
    3.2.   State resonance in series circuit.
    3.3.   State various ways of securing resonance in series circuit.
    3.4.   Explain resonance with curve when varying frequency.
    3.5.   Determine resonance frequency in series circuit.

4. Understand the effect of bandwidth and Q-factor in series resonance.
    4.1   Describe the resonant curve and bandwidth in series resonance.
    4.2   Explain the effect of frequency upon reactance of the series resonance circuit.
    4.3   Show the graphical representation of series resonance.
    4.4   Explain resonance with curve when varying inductance.
    4.5   Explain resonance with curve when varying capacitance.
    4.6   Define Q-factor of a series resonance circuit.
    4.7   Solve problems related to series resonance.
    4.8   List the applications of series resonance.

5. Apply the principle of resonance in parallel circuit.
    5.1.   State resonance in parallel circuit.
    5.2.   Describe the resonant curve and bandwidth in parallel resonance.
    5.3.   Determine the resonance frequency in parallel circuit with R-L and RC branch.
    5.4.   State the condition for resonance in parallel circuit with L & R in one branch and C only in other.
    5.5.   Show the graphical representation of parallel resonance.

6. Understand the effect of bandwidth and Q-factor in parallel resonance.
    6.1   Define dynamic impedance and current magnification.
    6.2   Describe the effect of Q-factor and bandwidth in parallel resonance circuit.
    6.3   List the applications of series and parallel resonance.
    6.4   Express mathematical deduction of the exact and approximate formula for parallel resonance.
    6.5   Solve problems on parallel resonance.
    6.6   Compare resonance in series circuit with that in parallel circuit.

POLYPHASE SYSTEM

7. Understand the concept of poly phase power system.
    7.1.   Explain the term poly phase AC system.
    7.2.   List the advantages of poly phase power system over single-phase power system.
    7.3.   State the generation of poly phase emf.
    7.4.   Sketch the wave diagram for a poly phase power system.
    7.5.   Draw vector diagram for a poly phase power system.

8. Understand the concept of expressing poly phase power system.
    8.1.   State the meaning of double subscript notation.
    8.2.   Identify the phase sequence of poly-phase system.
    8.3.   State the effects of reverse phase sequence.
    8.4.   Explain the methods of checking phase sequence.
    8.5.   Sketch the phase sequence diagram of 3-phase power system.

9. Understand the concept of poly phase for interconnection.
    9.1.   State possible ways of interconnection of 3-phase power system.
    9.2.   Sketch the circuit diagram of star connected 3-phase 3-wire system.
    9.3.   List the application of 3-phase 3-wire star connected power system.
    9.4.   Sketch the circuit diagram of 3-phase 4-wire star connected power system.
    9.5.   List the application of 3-phase 4-wire star connected power system.
    9.6.   Draw the vector diagram of 3-phase 4-wire star connected power system.
    9.7.   Express the relation between line and phase quantities of voltage and current in a balanced 3-phase 3-wire star connected power system.
    9.8.   Simplify the relation between line and phase quantities of voltage and current in a balanced 3-phase 4-wire star connected power system.

10. Understand the concept of star connected power system.
    10.1.   Identify neutral wire in a 3-phase star connected system.
    10.2.   Express the current in the neutral wire in an unbalanced 3-phase 4-wire star connected system.
    10.3.   Draw the phasor diagram of 3-phase 4-wire star connected system.
    10.4.   Express the formulae $I_L = I_P$ and $V_L = \sqrt{3} V_P$
    10.5.   Calculate volt-ampere, power and power factor in a balanced 3-phase 4-wire star connected power system.
    10.6.   Solve problems on star connected (balanced and unbalanced) power system.

11. Understand the concept of delta connected power system.

11.1. Sketch the circuit diagram of 3-phase delta connected power system.

11.2. Draw the vector diagram of a 3-phase delta connected power system.

11.3. Express the deduction of the formula $V_L = V_P$ and $I_L = \sqrt{3}\, I_P$ for delta connected power system.

11.4. Express the relation between line and phase current & voltage in a delta connected power system.

11.5. Calculate the volt-ampere, power and power factor in a 3-phase delta connected power system.

11.6. Solve problems on delta connected balanced power system.

11.7. Compare the advantages of star connected system with those of delta connected power system.

12. Understand the concept of unbalanced power system.

12.1. State the meaning of unbalanced power system.

12.2. Explain Fortescue`s theorem.

12.3. Explain the positive sequence power system.

12.4. Explain the negative sequence power system.

12.5. Explain the zero sequence power system.

12.6. Explain the neutral current of unbalanced system.

12.7. Solve problems related to unbalanced system.

NON-SINUSOIDAL WAVES

13.Understand the principle of non sinusoidal waves.

13.1 State non-sinusoidal waves.

13.2 Explain non-sinusoidal waves as the sum of sine and cosine waves of different frequencies with graphical and mathematical representation.

13.3 State harmonics.

13.4 Explain harmonics in the **Y**-system.

13.5 Explain harmonics in the △ystem

14. Understand power of non-sinusoidal waves.

14.1 Calculate effective value of non-sinusoidal wave.

14.2 Explain power due to non-sinusoidal voltage and current.

14.3 Calculate volt-ampears due to non-sinusoidal voltage and current.

15. Understand power factor of non-sinusoidal waves.

15.1 Explain power factor due to non-sinusoidal waves.

15.2 Explain equivalent sine wave of non-sinusoidal wave.

15.3 Explain addition and subtraction of non-sinusoidal wave.

15.4 Solve problems related with non-sinusoidal wave.

Practical :

1. **Determine resonance frequency and draw resonance curve from RLC series circuit. by changing frequency , Inductance, Capacitance.**
    1.1   Sketch the circuit diagram for RLC series resonance.
    1.2   Select equipment, tools and materials for the experiment.
    1.3   Connect the circuit according to the sketch.
    1.4   Check all connection points before actual operation.
    1.5   Record the readings from the meter applying power supply to the circuit.
    1.6   Find the value of current, resistance, inductive reactance, capacitive reactance and impedance.

2. **Determine resonant frequency in RLC parallel circuit and draw of resonance curve.**
    2.1   Sketch the circuit diagram for RLC parallel resonance.
    2.2   Select equipment, tools and materials for the experiment.
    2.3   Connect the circuit according to the sketch.
    2.4   Check all connection points before actual operation.
    2.5   Record the data from the meter applying power supply to the circuit.
    2.6   Find current, resistance, inductive reactance, capacitive reactance and impedance.
    2.7   Sketch the resonance curve with the frequency as abscise and current, resistance, inductive rectance, capacitive reactance and impedance as ordinate.

3. **Demonstrate poly-phase system and phase sequence.**
    3.1   Sketch the circuit diagram of poly-phase system and phase sequence.
    3.2   Select equipment, tools and materials for the experiment.
    3.3   Switch on the poly-phase system of your laboratory.
    3.4   Measure the phase voltages by voltmeter.
    3.5   Observe the phase voltages by oscilloscope.
    3.6   Compute phase sequence.
    3.7   Note down the observations.

4. **Measure line and phase voltage & current in 3-phase star connected inductive load.**
    4.1   Sketch the circuit diagram for 3-phase star connected load.
    4.2   Select the tools, instrument and materials required for the experiment.
    4.3   Connect the circuit according to the circuit diagram.
    4.4   Check all connection points before connecting the power supply to the circuit.
    4.5   Record the readings of the instruments.
    4.6   Compare the recorded values with calculated values.
    4.7   Note down the observations.

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

6. Construct vector diagram by measuring current, voltage and power in a balanced 3-phase star connected inductive load.

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

7. Construct vector diagram by measuring current, voltage and power in a balanced 3-phase delta connected inductive load.

 7.1 Sketch the circuit diagram for measuring power by 3-watt meter method in a 3-phase delta connected load.
 7.2 Select equipment, tools and materials for the experiment.
 7.3 Connect the circuit according to the circuit diagram.
 7.4 Check all connections 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 $P_t = \sqrt{3} \, V_L I_L \cos\theta$
 7.7 Draw the vector diagram using relevant data.
 7.8 Note down the observations.

8. Measure power and neutral current in a 3-phase, 4-wire unbalanced system.

 8.1 Sketch the circuit diagram for measuring power and neutral current in 3-phase 4-wire unbalanced load.

8.2 Select equipment, tools, instrument and materials for the experiment.
8.3 Construct the circuit according to the circuit diagram.
8.4 Check all connections & instruments before actual operation.
8.5 Record the readings from the meters used in the circuit.
8.6 Calculate the power and neutral current.
8.7 Calculate the phase angles.
8.8 Note down the observations.

9. Measure line and phase voltage and current of a 3-phase star connected capacitive load.

9.1 Sketch the circuit diagram for measurement of line and phase voltage and current of a 3-phase star connected capacitive load.
9.2 Select equipment, tools and materials required for the experiment.
9.3 Construct the circuit as per diagram with proper instrument.
9.4 Record the readings from the meters used in the circuit.
9.5 Calculate the line and phase voltage & current from the formula

$$I_L = I_P \text{ and } V_P = \frac{VL}{\sqrt{3}}$$

9.6 Note down the observations.

10. Measure line and phase current and voltage in 3-phase delta connected capacitive load.

10.1 Sketch the circuit diagram for measuring line and phase voltage and current of a balanced 3-phase delta connected capacitive load.
10.2 Select tools, instruments and materials required for the experiment.
10.3 Build up the circuit according to the circuit diagram.
10.4 Record the readings from the meters.
10.5 Calculate the line and phase voltage and current from the formula

$$V_L = V_P \text{ and } I_L = \sqrt{3} \, I_P.$$

10.6 Note down the observations.

11 Measure 3-phase power by 3-watt meter method in a balanced 3-phase star connected capacitive load.

11.1 Sketch the circuit diagram for measuring 3-phase power by 3-watt meter method of a balanced 3-phase star connected capacitive load.
11.2 Select tools, instrument and materials required for the experiment.
11.3 Build up the circuit according to the circuit diagram.
11.4 Check all connections before actual operation.
11.5 Record the readings from the meters.
11.6 Calculate the power from the formula

$$P_t = W_1 + W_2 + W_3 \text{ and } P_t = \sqrt{3} \, V_L I_L \cos\theta$$

11.7   Draw the vector diagram using relevant data as obtained.

11.8   Note down the observations.

12. Measure 3-phase power by 3-watt meter method in a balanced 3-phase delta connected capacitive load.

12.1   Sketch the circuit diagram for measuring 3-phase power by 3-watt meter method in a balanced 3-phase delta connected capacitive load.

12.2   Select equipment, tools and materials required for the experiment.

12.3   Connect the circuit according to the circuit diagram.

12.4   Check all connection points before connecting to the power supply.

12.5   Record the readings from the meters.

12.6   Calculate the power from the formula

$P_t = W_1 + W_2 + W_3$ and $P_t = \sqrt{3} \, V_L I_L Cos\theta$

12.7   Draw the vector diagram using relevant data as obtained.

12.8   Note down the observations.

13. Perform star-delta conversion in a power system.

13.1   Draw the circuit diagram of a balanced 3-phase star and delta connection.

13.2   Select equipment, tools and materials for the experiment.

13.3   Build up the circuit for star connection.

13.4   Check all connection points before actual operation.

13.5   Record the readings form the meters connected in the circuit.

13.6   Calculate the equivalent values of impedance in delta connection.

13.7   Build up a circuit with equivalent values of impedance in delta connection.

13.8   Record the reading for delta connection.

13.9   Compare the result.

13.10   Note down the observations.

REFERENCE BOOKS

1. A text book of Electrical Technology
                        – B. L Theraja.
2. Introduction to Electrical Engineering
                        – V. K. Mehta.
3. AC Circuit
                        – Corcoran.

6811	**BASIC ELECTRONICS**	**T**	**P**	**C**
		2	**3**	**3**

OBJECTIVES
- To provide understanding soldering technique and color code.
- To provide understanding and skill on the basic concept of semiconductor and to identify physically a range of semiconductor diodes.
- To develop comprehensive knowledge and skill on special diodes and devices.
- To develop the abilities to construct different rectifier circuits.
- To provide understanding of the basic concept and principle of transistor and to identify physically a range of transistor.
- To provide understanding and skill on the basic concept of logic gates.
- To provide the understanding skill on using Electronic measuring and testing equipment.

SHORT DESCRIPTION
Color code and soldering; Semiconductor; P-N junction diode; Special diodes and devices; Power supply; Transistor; Transistor amplifier; Logic gates Electronic measuring and test equipment.

DETAIL DESCRIPTION
Theory:
1   Understand the Concept of soldering and Color Code.

1.1   Define soldering.
1.2   Describe the different types of solder.
1.3   List the things needed in soldering.
1.4   Mention the properties of a good soldered joint.
1.5   Describe the functions and construction of (i) Single sided, (ii). Double sided & (III) Multi layered Printed circuit board.
1.6   Mention the function of resistor, capacitor and inductor in electronic circuits.
1.7   Describe the procedure of determining the value of Capacitor, & Resistor using numeric and color code.

2   Understand the Concept of Semiconductor.
2.1   Define Conductor, Semiconductor and Insulator.
2.2   Describe Semiconductor with atomic structure.
2.3   Describe the effect of temperature on conductivity of Semiconductor.
2.4   Explain the energy band diagram of Conductor, Semiconductor and Insulator.
2.5   Classify Semiconductor.
2.6   Describe the generation & recombination of hole and electron in Intrinsic Semiconductor.

2.7   Define doping, P-type & N-Type material, covalent bond, majority & minority charge carrier.

2.8   Explain the characteristics of Carbon, Gallium Arsenide/Phosphide.

3   Understand the Concept of P-N Junction Diode

3.1   Define PN junction diode

3.2   Describe the formation of depletion layer in PN junction.

3.3   Discuss potential barrier, drift & diffusion current and their physical significance.

3.4   Mention the behavior of PN junction under forward and reverse bias.

3.5   Explain the forward & reverse current voltage (IV) characteristics of PN junction diode.

3.6   Explain the effect of temperature Si & Ge diode characteristics

3.7   Define (i) static resistance (II) Dynamic resistance, (III forward breakdown voltage and (II) Reverse break down voltage.

3.8   Draw the equivalent circuit of PN junction diode.

3.9   Describe the specification of diode.

4   Understand the DC power supplies.

4.1   Define dc power supply.

4.2   Mention the importance of dc power supply.

4.3   Define rectification and rectifier.

4.4   Explain the operation of Half wave, Full wave and Bridge rectifier.

4.5   Discuss ripple factor & efficiency and TUF of Half wave, Full wave and Bridge rectifier.

4.6   Explain the operation of different types filter circuits with wave shape.

4.7   Define regulated and unregulated power supply.

4.8   Describe the block diagram of a typical regulated dc power supply.

5   Understand the Concepts of Special diode.

5.1   Define Zener break down.

5.2   Describe the operation of Zener diode.

5.3   Explain IV characteristics of Zener diode.

5.4   Describe the application of Zener diode in (i) voltage stabilization, (ii) meter protection and (II) peck clipper circuits.

5.5   Describe the construction operation and application of (I) Tunnel diode (II) varactor diode (III) Schottky diode (iv) Step-Recovery diode (v) PIN diode, (vi) LED   (vii) LCD (viii) photo diode (ix) Solar cell.

5.6   Describe the construction operation and application of (i) DIAC (ii) TRIAC and (iii) SCR.

6   Understand the construction and operation of Bipolar Junction Transistor (BJT)

6.1   Define Transistor.

6.2   Describe the construction PNP and NPN Transistor.

6.3   State the biasing rules of BJT.

6.4   Explain the mechanism of current flow of PNP and NPN Transistor.

6.5   Establish the relation among Base, Emitter and Collector current ($I_E = I_C + I_B$)

6.6   Draw the three basic transistor configuration circuits (CB, CC, CE).

6.7   Describe current amplification factor α , β and γ.

6.8   Establish the relation among α , β and γ.

6.9   Solve problem related to I_E, I_C, I_B, α , β and γ.

7   Understand the concept of BJT Amplifier

7.1   Define (i) Amplifier (ii) Amplification and (III) Gain

7.2   Mention the classification of Amplifier.

7.3   Describe the principle of operation of a common emitter (CE) Amplifier.

7.4   Draw DC & AC equivalent circuits of the CE amplifier circuit.

7.5   Mention the formula of (i) input resistance (ii) Output Resistance (iii) Current gain (iv) Voltage gain and (v) power gain.

7.6   Solve problem related to different gain resistance.

8   Understand the main feature of digital electronics

8.1   Describe the difference between analog and digital signal.

8.2   State the advantage of digital system.

8.3   Define logic gate.

8.4   Describe the basic operation of logic gates AND, OR, NOT NAND, NOR, XOR & XNOR.

8.5   Prepare truth table of logic gates AND, OR, NOT NAND, NOR, XOR & XNOR.

9   Understand the Electronic measuring and testing equipment

9.1   Define AVO meter.

9.2   Describe the procedure of measuring current, voltage and resistance using AVO meter.

9.3   List the control knobs of Oscilloscope.

9.4   Explain the procedure of measuring frequency and voltage using Oscilloscope.

9.5   Mention the function of (i) Function Generator (ii) Logic Probe (iii) Semiconductor Tester.

Practical :

1   Show skill in identifying the electronic components.

1.1   Observe the electronic components board and read the manuals.

1.2   Identify the different types of resistors with their values, tolerance and wattage.

1.3   Identify the different types of potentiometers with their values, & wattage.

1.4   Identify the different types of capacitors with their values, dc working voltages and types.

1.5   Identify the different types of diodes & rectifiers with the numbers and specifications.

1.6   Identify the different types of transistors and thyristors with their number and specifications.

1.7   Identify the different types of LED's, IC's and miniature relays with their number & specification.

1.8   Identify different types of transformer with their specification.

1.9   Identify different inductors with their values & current ratings.

1.10   Study the printed circuit boards.

1.11   Sketch the symbols of components used in electronic circuits.

1.12   Describe the basic function of each component.
1.13   Write a report on above activities.

2   **Show skill in electrical measurement.**
2.1   Perform simple voltage and current measurements on basic series and parallel resistor circuits using the following instruments.
    a)   Voltmeters and ammeters
    b)   AVO meters
    c)   Digital multimeter
    d)   Basic CRO

3   **Show skill for determining the values of different resistors and capacitors with the help of color code.**
3.1   Select color code resistors & capacitors of different values.
3.2   Identify the colors and their numerical numbers.
3.3   Determine the value of resistors with tolerance.
3.4   Determine the value of capacitors and dc working voltage.
3.5   Write a report on above activities.

4   **Show skill in performing soldering.**
4.1   Select wires (single strand and multi strand) and cut wires to required length.
4.2   Select soldering iron, soldering tag and soldering lead.
4.3   Remove wire insulation to required length.
4.4   Clean and tin both iron and work piece.
4.5   Use a tinned iron in order to transfer adequate heat to the joint.
4.6   Joint two singles stranded wires mechanically and solder.
4.7   Joint two multi-strand wires mechanically and solder.
4.8   Perform soldering exercise for making three dimensional wire frame.
4.9   Sketch and write a report on the job.

5   **Show skill in soldering & desoldering of electronic components and wires to the other components and circuit boards.**
5.1   Select electronic components, wires and PCB.
5.2   Determine the rating of the soldering iron suitable for the work piece.
5.3   Clean and tin both iron & work piece.
5.4   Feed new soldering materials to the tinned and heated joint, in order to produce a correctly soldering.
5.5   Check the quality of soldering.
5.6   Clean and tin iron and de-solder the joint and components.
5.7   Use solder suckers and solder braid for de-soldering.
5.8   Write a report on the Job.

6   Show skill in checking the semi-conductor diode.
6.1   Collect a range of semi-conductor diodes and manufactures literature.
6.2   Select the digital multimeter and set the selector switch to ohm range.
6.3   Determine the specification of semi-conductor diode.
6.4   Compare the determined specification with that of manufactures literature.
6.5   Measure forward & reverse resistances of the diode.
6.6   Identify p and p side of the diode.
6.7   Determine the condition of the diode.

7   Show skill in sketching forward and reverse characteristics curves of a semiconductor diode.
7.1   Select meter, power supply, components and materials.
7.2   Complete circuit according to circuit diagram for forward bias.
7.3   Check all connections.
7.4   Measure forward bias and corresponding forward current.
7.5   Record results in tabular form.
7.6   Connect circuit according to circuit diagram of reverse bias.
7.7   Measure reverse bias and corresponding reverse current.
7.8   Record results in tabular form.
7.9   Sketch the curves form data.

8   Show skill in sketching waves of half wave rectifier circuit.
8.1   Select meter, component, oscilloscope and materials.
8.2   Complete circuit of a half wave rectifier according to circuit diagram.
8.3   Check the circuit before operation.
8.4   Measure the input and output voltage and observe wave shapes in the oscilloscope.
8.5   Sketch the output voltage wave shape.

9   Show skill in sketching waves of full wave center tapped rectifier circuit.
9.1   Select meter, component, oscilloscope and materials.
9.2   Complete a full wave rectifier circuit according to circuit diagram.
9.3   Check the circuit supply & polarity of supply.
9.4   Measure the input & output voltages and observe wave shapes in the oscilloscope.
9.5   Sketch the output voltage wave shape.
9.6   Compare the result with half-wave rectifier circuit.

10   Show skill in constructing full wave bridge rectifier.
10.1   Select meter, component, oscilloscope and materials.
10.2   Build the circuit according to the circuit diagram.
10.3   Check the circuit.
10.4   Measure the input and output voltage.
10.5   Observe wave shape.
10.6   Compare the result with other rectifiers.

11   Show skill in identifying the bipolar junction transistor.
    11.1   Select pnp & npn bipolar junction transistors.
    11.2   Take DMM and manufacture's literature of transistor.
    11.3   Identify transistor legs.
    11.4   Measure base-emitter, base-collector, forward and reverse resistance.
    11.5   Determine the specifications with help of manufacturer's literatures.
    11.6   Identify pnp & npn transistor.

12   Show skill in determining input and output characteristics of a transistor in common emitter connection.
    12.1   Select component, AVO meters, circuit board and required materials.
    12.2   Construct the circuit.
    12.3   Adjust the biasing voltage to appropriate point.
    12.4   Record input and output voltage and current.
    12.5   Plot the curve with recorded data.

13   Show skill in testing special diodes.
    13.1   Select different types of special diodes.
    13.2   Set the AVO meter in the ohm scale.
    13.3   Measure resistances for each of two terminals.
    13.4   Determine the condition (good and bad).
    13.5   Determine the different terminals.

14   Verify the truth tables of different types of logic gates.
    14.1   Select the specific gate.
    14.2   Prepare the experimental circuit.
    14.3   Adjust the power supply.
    14.4   Verify the truth table.

REFERENCE BOOKS :
    1.   A Text Book of Applied Electronics   - R.S. SEDHA
    2.   Principles of Electronics   - V. K. Mehta
    3.   Basic Electronics (Solid Stater)   - B. L. Theraja
    4.   Electronic Devices and Circuit Theory   - ROBERT BOYLESTAD
                                                              - LOUIS NASHELSKY

6632	Computer Application -II	T	P	C
		0	6	2

OBJECTIVES

To develop skill on spreadsheet applications.
To develop skill on creating graphs.
To assist in the efficient use of database packages.
To develop skill on computerized database management.
To develop skill on programming with database management.

SHORT DESCRIPTION

Spreadsheet Analysis Package: Applications of spreadsheet; Using worksheet; Apply formula and functions in worksheet; Creating & printing graphs; Create simple macros.

Database management package: Creating the database; Editing the database; Searching the records; Customizing the data entry form; Creating the query; Arranging the records; Generating reports.

Database management language: Creating a command file; Writing simple database program using decision-making commands.

DETAIL DESCRIPTION

SPREAD SHEET ANALYSIS PACKAGE:

1   Apply the basic skills of a spreadsheet software package
    1.1   Run a spreadsheet software package.
    1.2   Identify and use different areas (working area, border area, control panel, mode indicator, and status indicator) of the worksheet screen.
    1.3   Identify the function of different keys (typing key, calculator key, text key, cursor key, etc.)of the keyboard.
    1.4   Move around the worksheet using keys and combination of key.
    1.5   Identify and use the on-screen help facility.
    1.6   Identify and use the types of data, numbers, labels and formula.
    1.7   Demonstrate menus, submenus, pop-up menu, etc.

2   Manage workbooks and windows.
    2.1   Make and use workbooks.
    2.2   Access different types of files.
    2.3   Open files as read only.
    2.4   Demonstrate the options for saving files.

2.5   Display a workbook in more than one window.

2.6   Work with more one workbook.

2.7   Close a workbook.

3   Create a worksheet and use simple commands.

3.1   Activate entries in a worksheet.

3.2   Use edit key (F2) to correct or to modify entries.

3.3   Activate the command menus and select commands.

3.4   Save the worksheet.

3.5   Exit from spreadsheet .

3.6   Retrieve a previously saved worksheet.

3.7   Modify the worksheet.

3.8   Save a modified worksheet.

4   Apply formula, function and using templates.

4.1   Use simple formulae to solve arithmetical computation.

4.2   Use arithmetical operators in formula.

4.3   Edit formula.

4.4   Use mathematical function to solve simple equations.

4.5   Make and use workbook templates.

4.6   Make changes in existing workbook templates

4.7   Validate numbers, dates, times & text.

4.8   Show custom validation.

5   Solve engineering problems using formula and functions

5.1   Use mathematical functions to compute trigonometric values, absolute values, random number, square root, logarithmic values, etc for solving engineering problems.

5.2   Use logical functions to perform an operation depending on a condition in engineering problem.

5.3   Use statistical function to compute summation, average, minimum value, maximum value, etc in engineering problem.

6   Work with cell pointer to a particular cell.

6.1   Use GOTO key to move the cell pointer to particular cell.

6.2   Use the ABSOLUTE KEY to change cell address from one from to another in formula or in functions.

6.3   Enter range in formulae or in functions by typing directly or by using cell pointer.

6.4   Create a range name.

6.5   Use range name in formula & functions.

6.6   Copy, Move & Erase cell range.

7   Format a worksheet.
  7.1   Change the width of a column, a range of column, and change the columns
          width globally.
  7.2   Insert blank columns and blank rows in a worksheet.
  7.3   Delete columns and blank rows in a worksheet.
  7.4   Format the display of data of a worksheet globally or by referring a range of
          cells (e.g. currency format, exponential format, comma format, etc.).
  7.5   Format the display of data and of a worksheet globally or referring of cells.
  7.6   Protect worksheet, function, formula, important text and unprotect a range for
          entering entries.
  7.7   Work with window for viewing worksheet in different ways and freeze rows or
          columns.
  7.8   Create, change and delete a style.

8   Exercise on Sorting, Searching and Worksheet Printing.
  8.1   Create a database program
  8.2   Sort a database in different ways.
  8.3   Search a record from the database using search criteria.
  8.4   Extract records from the database that match a given criteria.
  8.5   Delete records that a given criteria from the database using available
           database commands.
  8.6   Show the Print Preview and adjust Page setup option.
  8.7   Create and use page headers of footers.
  8.8   Set print area, print titles and different print option
  8.9   Print portion of worksheet and multiple worksheets
  8.10   Print ranges from different worksheets on the same pages.

9   Create and Print graphs.
  9.1   Create bar, line, X-Y and pie graphs.
  9.2   Add color, titles, legend, gird and levels to the graph.
  9.3   Add visual impact with colors.
  9.4   Create linked pictures.
  9.5   Save the graph and assign names to different graphs of a single worksheet.
  9.6   Print graphs (low or high quality graphs.)
  9.7   Plot graphs using a plotter using different colors.
  9.8   Change graphs size, print & plot them.

10   Create Macros and using macro commands.
  10.1   Create simple macros (e.g. to change the width of a cell, to format a cell
          display, to erase a range of cells etc.) using keystroke commands.
  10.2   Create a macro to convert values into labels vice versa.

10.3 Create a macro for inserting blank rows between two rows of data in a worksheet.

10.4 Create a macro for deleting the inserted blank rows in a worksheet.

DATABASE MANAGEMENT PACKAGE:

11   Create the new database.
11.1   Identify the practical database in real world.
11.2   Identify the fields and records of a database.
11.3   Identify the different phases of database design.
11.4   Collect the data form a typical field.
11.5   Determine the category of a typical field.
11.6   Design a typical Paper- pencil database form raw data.
11.7   Run a generalized database management package and identify its display
        Screen
11.8   Identify the different options of the selected packages.
11.9   Use the on-screen help facilities of DBMS package
11.10 Create and save the table structure.

12   Change the table structure and edit database.
12.1   Modify and Edit the table structure.
12.2   Verify the structure (i.e. data of update, number of records. etc)
12.3   Enter or append the new records in the database.
12.4   Use the key combinations for editing.
12.5   Use the available options to edit fields.
12.6   Delete unwanted records and files.
12.7   Save & close database file.
12.8   Use different modes to append and edit records of database.

13   Search, display and arrange the records of database.
13.1   View a database using list and display command
13.2   Retrieve the database records with different conditions.
13.3   Search within a field.
13.4   Keep the track of specific records.
13.5   Keep the database up-to-date.
13.6   Sort a database on single or multiple fields.
13.7   Sort with qualifier (i.e. sort with specific subset of records).
13.8   Index the database on single or multiple fields.

13.9   Use the function to index on different field types.
13.10   Use the commands for selective indexing and to control the order of records.

14   Create the customized data entry form.
    14.1   Draw a typical data entry screen with paper-pencil work.
    14.2   Design the screen with all fields.
    14.3   Move the field to make the entry form logical and easy to use.
    14.4   Change the field width.
    14.5   Add or delete field (if necessary).
    14.6   Change the display characteristics of fields.
    14.7   Use picture functions template and range to format the displayed data.
    14.8   Use different options and commands in design menu.
    14.9   Draw lines and boxes on the form.

15   Create the query.
    15.1   Display and identify query design screen.
    15.2   Build a simple query
    15.3   Save & apply the query.
    15.4   Use the query design menu options.
    15.5   Use the symbols and operators to build query.
    15.6   Search the records with matching on two or more fields.
    15.7   Select the records within range using range operators.
    15.8   Find the records with inexact and complex matching.
    15.9   Sort the records within queries.

16   Generate the custom reports.
    16.1   Send the reports to the screen or to a file.
    16.2   Use the print menu options and dos-prompt options.
    16.3   Produce a quick and selective report.
    16.4   Plan the design of the report.
    16.5   Design a custom columnar report.
    16.6   Find the parts of a report specification.
    16.7   Make the changes to the report specification.
    16.8   Save & run the report.
17   Work with multiple database and relationship.
    17.1   Merge the data form one file to another.
    17.2   View   the files to relate two or more database files.
    17.3   Set up the relationship.
    17.4   Modify the relationship.
    17.5   Create the report from relational database.

DATABASE MANAGEMENT LANGUAGE:

18   **Create a simple command file using expression and function.**
   18.1   Identify the database editor.
   18.2   Use the commands to assign different types of data values to variables.
   18.3   Save the memory variable.
   18.4   Display the memory variable.
   18.5   Release & restore the memory variable.
   18.6   Use the mathematical expression.
   18.7   Use the mathematical, relational, logical and string operators.
   18.8   Use the common function such as EOF, BOF DATE, UPPER & LOWER<
            CTOD, DTOS, SPACE, TRIM, STR, etc. in command file.
   18.9   Use the commonly use commands such as SET TALK, SKIP, RETURN in
            command file.
   18.10   Use the commands to display a string of characters and wait for user response.
   18.11   Use commands to display or print text.

19   **Design & write simple programs.**
   19.1   Identify the basic steps to design a program.
   19.2   Write the pseudocode for simple program.
   19.3   Convert the pseudocode into actual program code.
   19.4   Verify & documents the simple program.
   19.5   Save the command file and then exit.
   19.6   Run the program.

20   **Use the decision making commands in Programs.**
   20.1   Use DO WHILE ---- ENDDO, IF ---- ENDIF and DO CASE ---- ENDCASE to
            control program flow.
   20.2   Use SCAN ---- ENDSCAN command instead of DO WHILE ---- ENDDO.
   20.3   Use IF, ELSE and ENDIF commands to branch to the part the program.
   20.4   Use nested IF ---- ENDIF statements.
   20.5   Write simple program using decision making commands.
   20.6   Use immediate IF function.
   20.7   Write simple program using immediate IF function.
   20.8   Use CASE ---- ENDCASE statement instead more than three IF ---- ENDIF
            statements.
   20.9   Use the EXIT, CANCEL, WAIT and ZAP command in database program.
   20.10   Use macro function within programs.

5931 **MATHEMATICS – III** **T P C**

3 3 4

AIMS

- To make understand the basic concept and techniques of composition and resolution of vectors and computing the resultant of vectors.

- To enable to use the knowledge of gradient of a straight line in finding speed, acceleration etc.

- To enable to use the knowledge of conic in finding the girder of a railway bridge, cable of a suspension bridge and maximum height of an arch.

- To provide ability to apply the knowledge of differential calculus in solving problem like slope, gradient of a curve, velocity, acceleration, rate of flow of liquid etc.

- To enable to apply the process of integration in solving practical problems like calculation of area of a regular figure in two dimensions and volume of regular solids of different shapes.

SHORT DESCRIPTION

Vector *:* Addition and subtraction, dot and cross product.

Co-ordinate Geometry : Co-ordinates of a point, locus and its equation, straight lines, circles and conic.

Differential Calculus : Function and limit of a function, differentiation with the help of limit, differentiation of functions, geometrical interpretation of $\frac{dy}{dx}$, successive differentiation and Leibnitz theorem, partial differentiation.

Integral Calculus : Fundamental integrals, integration by substitutions, integration by parts, integration by partial fraction, definite integrals.

DETAIL DESCRIPTION

Vector

1 **Apply the theorems of vector algebra.**
   1.1 Define scalar and vector.
   1.2 Explain null vector, free vector, like vector, equal vector, collinear vector, unit vector, position vector, addition and subtraction of vectors, linear combination, direction cosines and direction ratios, dependent and independent vectors, scalar fields and vector field.
   1.3 Prove the laws of vector algebra.
   1.4 Resolve a vector in space along three mutually perpendicular directions

1.5   solve problems involving addition and subtraction of vectors.

2   Apply the concept of dot product and cross product of vectors.
2.1   Define dot product and cross product of vectors.
2.2   Interpret dot product and cross product of vector geometrically.
2.3   Deduce the condition of parallelism and perpendicularity of two vectors.
2.4   Prove the distributive law of dot product and cross product of vector.
2.5   Explain the scalar triple product and vector triple product.
2.6   Solve problems involving dot product and cross product.

CO-ORDINATE GEOMETRY

3   Apply the concept of co-ordinates to find lengths and areas.
3.1   Explain the co-ordinates of a point.
3.2   State different types of co-ordinates of a point.
3.3   Find the distance between two points (x_1, y_1) and (x_2, y_2).
3.4   Find the co-ordinates of a point which divides the straight line joining two points in certain ratio.
3.5   Find the area of a triangle whose vertices are given.
3.6   Solve problems related to co-ordinates of points and distance formula.

4   Apply the concept of locus.
4.1   Define locus of a point.
4.2   Find the locus of a point.
4.3   Solve problems for finding locus of a point under certain conditions.

5   Apply the equation of straight lines in calculating various parameter.
5.1   Describe the equation $x=a$ and $y=b$ and slope of a straight line.
5.2   Find the slope of a straight line passing through two point $(x_1, y_1,)$ and (x_2, y_2).
5.3   Find the equation of straight lines:
        i)   Point slope form.
        ii)   Slope intercept form.
        iii)   Two points form.
        iv)   Intercept form.
        v)   Perpendicular form.
5.4   Find the point of intersection of two given straight lines.
5.5   Find the angle between two given straight lines.
5.6   Find the condition of parallelism and perpendicularity of two given straight lines.
5.7   Find the distances of a point from a line.

6   Apply the equations of circle, tangent and normal in solving problems.
6.1   Define circle, center and radius .
6.2   Find the equation of a circle in the form:

i) $x^2 + y^2 = a^2$

ii) $(x - h)^2 + (y - k)^2 = a^2$

iii) $x^2 + y^2 + 2gx + 2fy + c = 0$

6.3   Find the equation of a circle described on the line joining (x_1, y_1) and (x_2, y_2).

6.4   Define tangent and normal.

6.5   Find the condition that a straight line may touch a circle.

6.6   Find the equations of tangent and normal to a circle at any point.

6.7   Solve the problems related to equations of circle, tangent and normal.

7.   **Understand conic or conic sections.**

7.1   Define conic, focus, directrix and eccentricity.

7.2   Find the equations of parabola, ellipse and hyperbola.

7.3   Solve problems related to parabola, ellipse and hyperbola.

DIFFERENTIAL CALCULUS

FUNCTION AND LIMIT

8.   **Understand the concept of functions and limits.**

8.1   Define constant, variable, function, domain, range and continuity of a function.

8.2   Define limit of a function

8.3   Distinguish between f(x) and f(a).

8.4   Establish   i) $\lim_{x \to 0} \dfrac{\sin x}{x} = 1$

               ii) $\lim_{x \to 0} \dfrac{\tan x}{x} = 1$.

9.   **Understand differential co-efficient and differentiation.**

9.1   Define differential co-efficient in the form of

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

9.2   Find the differential co-efficient of algebraic and trigonometrical functions from first principle.

10.   **Apply the concept of differentiation.**

10.1   State the formulae for differentiation:

      i)   sum or difference
      ii)   product
      iii)   quotient
      iv)   function of function
      v)   logarithmic function
      Find the differential co-efficient using the sum or difference formula, product formula and quotient formula.

10.2   Find the differential co-efficient function of function and logarithmic function.

11.   **Apply the concept of geometrical meaning of $\dfrac{dy}{dx}$**

    11.1   Interpret $\dfrac{dy}{dx}$ geometrically.

    11.2   Explain $\dfrac{dy}{dx}$ under different conditions

    11.3   Solve the problems of the type:
           A circular plate of metal expands by heat so that its radius increases at the rate

of 0.01 cm per second. At what rate is the area increasing when the radius is 700 cm ?

12   **Use Leibnitz's theorem to solve the problems of successive differentiation.**
    12.1   Find 2nd, 3rd and 4th derivatives of a function and hence find   n-th derivatives.
    12.2   Express Leibnitz's theorem
    12.3   Solve the problems of successive differentiation and Leibnitz's theorem.

13   **Understand partial differentiation.**
    13.1   Define partial derivatives.
    13.2   State formula for total differential.
    13.3   State formulae for partial differentiation of implicit function and homogenous function.
    13.4   State Euler's theorem on homogeneous function.
    13.5   Solve the problems of partial derivatives.

INTEGRAL CALCULUS

14   **Apply fundamental indefinite integrals in solving problems.**
    14.1   Explain the concept of integration and constant of integration.
    14.2   State fundamental and standard integrals.
    14.3   Write down formulae for:
    i) Integration of algebraic sum.
    ii) Integration of the product of a constant and a function.
    14.4   Integrate by method of substitution, integrate by parts and by partial fractions.

14.5   Solve problems of indefinite integration.

15   Apply the concept of definite integrals.
15.1 Explain definite integration.

15.2 Interpret geometrically the meaning of $\int_a^b f(x)dx$

15.3 Solve problems of the following types:

i) $\int_0^{\frac{\pi}{2}} \cos^2 xdx$ ii) $\int_0^1 \frac{\left(\sin^{-1} x\right)^2}{\sqrt{1-x^2}} dx$

P* =Practical continuous assessment

5922   **PHYSICS–II**   **T**   **P**   **C**

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AIMS

- To provide a foundation in scientific principles and processes for the understanding and application of technology.
- To develop an understanding of fundamental scientific concepts through investigation and experimentation.
- To provide a common base for further studies in technology and science.
- To develop the basic knowledge of modern physics.

Short description

Thermometry; Calorimetry, Expansion of materials (effect of heat); Heat transfer;
Nature of heat and its mechanical equivalent; Engine.
Principles of light and Photometry; Reflection of light; Refraction of light ; lens.
Concept of Electron and photon; structure of atom, Theory of Relativity.

Detail description
<u>**Theory :**</u>
1.   **Thermometry**
    1.1   Define heat and temperature.
    1.2   Mention the units of measurement of heat and temperature.
    1.3   Distinguish between heat and temperature.
    1.4   Identify the sources of heat.
    1.5   Identify the range of the Celsius scale determined by the boiling point and melting point of water
    1.6   Compare the Celsius scale, Roamer scale, Fahrenheit scale, Kelvin scale and Rankin scale of temperature measurement.
    1.7   State the construction and graduation of a mercury thermometer.
    1.8   Describe the operation of different types of thermometers (e.g., maximum and minimum thermometer, clinical thermometer).
2.   **Heat capacity of materials (calorimetric)**
    2.1   State the heat as a form of energy.
    2.2   Define specific heat capacity.
    2.3   State SI units of measurement of specific heat capacity as J/Kgc^0 or J/Kgk^0.
    2.4   Define thermal capacity and water equivalent.
    2.5   Differentiate between thermal capacity and water equivalent.
    2.6   Mention the specific heat capacity of different materials.

2.7 Prove the total heat gained by an object is equal to the sum of the heat lost by all the surrounding objects.

2.8.1 Identify specific latent heat as the energy consumed or liberated when water vaporizes or condenses and when ice melts or freezes.

2.8.2 Explain the effects of a change in pressure on the melting point and boiling point of water.

2.9 Define various kinds of specific latent heat.

2.9.1 Determine the latent heat of fusion of ice and latent heat of vaporization of water.

3.   Effects of heat on dimension of materials

3.1 Show that different materials change in size at different amounts with the same heat source.

3.2 Explain the meaning of differential expansion in bimetallic strip, thermostats, compensated pendulum etc.

3.3 Explain the methods of overcoming problems caused by the expansion of materials in buildings, machinery, railway lines and bridges.

3.4 Define the co-efficient of linear, superficial and cubical expansion of solids.

3.5 Mention the units co-efficient of linear, superficial and cubical expansion of solids.

3.6 Mention the linear, Superficial and cubical expansion of a range of common engineering materials.

3.7 Define real and apparent expansion of liquid.

3.8 Define and explain the co-efficient of real and apparent expansion of liquid.

3.9 Distinguish between the co-efficient of real and apparent expansion of liquid.

3.10 Determine the co-efficient of real and apparent expansion of liquid.

4.   Heat transfer

4.1 Identify the phenomenon of heat transferring from hot bodies to cold bodies.

4.2 Explain the methods of heat transfer by conduction, convection and radiation with examples of each type of transfer.

4.3 Define thermal conductivity (K) & rate of heat transfer.

State the SI units of thermal conductivity as $\dfrac{w}{mk}$ or $\dfrac{w}{mc}$

4.4 List the factors which determine the quantity of heat (Q) flowing through a material.

4.5 Show that the quantity of heat flowing through a material can be found from Q

$$= \frac{KA\,(\theta_H - \theta_C)t}{d}$$

4.6 Outline the properties of materials which give thermal insulation.

4.7 Explain Characteristics of radiant heat energy.

4.8 Describe Emissive power and absorptive power of radiant heat.

4.9   State Stefan-Boltzman Law,

4.10   State Newton's law of cooling.

4.11   State wiens law.

4.12   Explain Green house effect.

5.   **Nature of heat and its mechanical equivalent**

5.1   Describe the caloric theory and kinetic theory of heat.

5.2   State the drawbacks of the caloric theory of heat.

5.3   Explain the mechanical equivalent of heat.

5.4   Explain the first law of thermodynamics .

5.5   Explain Isothermal and adiabatic change.

5.6   Explain Specific heat of a gas, Molar specific heat or molar heat capacity.

5.7   Relate between pressure and volume of a gas in adiabatic Change i, e;$PV\gamma$=const.

5.8   Difference between C_P and C_v for an ideal gas (C_P-C_v=R)

6.   **2nd law of thermodynamics**

6.1   State and Explain Reversible process and irreversible process.

6.2   State & explain 2nd law of thermodynamics

6.3   Explain heat engine.

6.4   Explain the principle of work of a heat engine.

6.5   Identify thermal efficiency of a heat engine.

6.6   Explain the working principles of internal combustion and external combustion engines (with fair sketches)

6.7   Distinguish between internal combustion engine and external combustion engine. Entropy : Definition, unit and significant.

6.8   Explain Change of entropy in a reversible and irreversible process.

6.9   Give an example of increase of entropy in irreversible process.

7.   **Preliminaries of light and photometry**

7.1   Define light, medium (transparent, translucent, opaque), luminous & non-luminous bodies, parallel, convergent & divergent rays, beam.

7.2   Show the travel of light in straight line.

7.3   Define photometry, luminous intensity, luminous flux, brightness and illuminating power.

7.4   Mention the units of luminous intensity, luminous flux, brightness and illuminating power.

7.5   Mention relation between luminous intensity & illuminating power.

7.6   Explain inverse square law of light.

7.7   Describe the practical uses of light waves in engineering.

8. Reflection of light

    8.1   Define mirror (plane & spherical), image (real & virtual) and magnification of images.

    8.2   Describe the reflection of light.

    8.3   State the laws of reflection of light.

    8.4   Express the verification of laws of reflection.

    8.5   Define pole, principal axis, center of curvature, radius of curvature, principal focus in case of concave & convex mirrors.

    8.6   Find the relation between focal length & radius of curvature of a concave & convex mirror.

    8.7   Express the general equation of concave and convex mirror.

9.   refraction of light

    9.1   Define refraction of light Give examples of refraction of light

    9.2   State the laws of refraction and Express the verification of laws of refraction

    9.3   Define absolute and relative refractive index and Relate absolute and relative refractive index

    9.4   Explain the meaning of total internal reflection and critical angle and Relate total internal reflection and critical angle.

    9.5   Give examples of total internal reflection.

    9.6   Describe refraction of light through a prism.

    9.7   Express the deduction of the relation between refractive index, minimum deviation and angle of the prism.

    9.8   Explain Dispersion of light.

    9.9   Define lens and mention the kinds of lens.

    9.10   Define center of curvature, radius of curvature, principal axis, 1_{st} and 2_{nd} Principal focus, optical center and power of lens.

    9.11   Express the deduction of the general equation of lens (eoncave & convex).

    9.12   Define Combination of two thin lenses and equivalent lens.

    9.13   Identify and List uses of lens.

10.   Electron and photon :

    10.1   Describe Electrical conductivity of gases.

    10.2   Describe Discharge tube.

    10.3   Cathode ray : Definition and its properties

    10.4   X-ray : Definition, properties & uses

    10.5   Discuss Photo electric effect .

    10.6   Derive Einstein's photo electric equation

11. **Structure of atom :**
    11.1   Atomic models : Thomson, Rutherford and Bohr model.
    11.2   Bohr Hydrogen atom & the theory of hydrogen spectra .
    11.3   Define and explain Radio activity.
    11.4   Describe Radio active rays.
    11.5   Deduce radioactive decay law.
    11.6   Define half-life & mean life of radioactive atoms.
    11.7   Define nuclear fission & fusion.

12. **Theory of relativity :**
    12.1   Express the theory of relativity.
    12.2   Mention different Kinds of theory of relativity.
    12.3   Explain special theory of relativity and its fundamental postulate.
    12.4   Deduce Einstein's mass -energy relation

Practical:
1.   Compare the operation of common thermometers.
2.   Determine the co-efficient of linear expansion of a solid by Pullinger's apparatus.
3.   Measure the specific heat capacity of various substances.(Brass, steel).
4.   Determine the latent heat of fusion of ice.
5.   Determine the water equivalent by calorimeter.
6.   Compare the luminous intensity of two different light sources.
7.   Verify the laws of reflection.
8.   Find out the focal length of a concave mirror.
9.   Determine the refractive index of a glass Slab.
10.   Determine the angle of Minimum deviation and refractive index of a glass prism by using I-D graph.

5711 **BANGLA** **T P C**
2 2 3

DÍ‡k¨t

1| fvlv`¶Zvng‡ni (Language skills) c‡Öh¨‡K †h‡MZvARÐ |

2| evsjv m�anZ¨ c…Vb- cˇl‡bi gva‡g evÓjx RZxqt‡ev, ˆ`k ‡c‡§, ˆbZKZ¡, g‡½c‡Í`v I gj¨ ‡ev‡ai D‡bl NUv‡bv|

msf¶ß weiYxt

evsjv fvlvt gvZ…fvlv I n‡Rbk¨j Zv; MÍ, KweZv, c‡ÖÜ, bvÍK I Dcb¨vmmKj‡b Ges evsjv fvlvi iwZZ evfbbvZ¡evib NUvZ mgmïv I D’PviY i‡xZ weiPb I c‡Í iPbv|

বিশদ বিবরণী ঃ

১ **বাংলা ভাষার নির্ভুল প্রয়োগ ঃ**

K) বাংলা ভাষা ঃ fvlvi msÁv, evsjv fvlvi DrcwË I µg weKvk, evsjv fvlvi iwZZ- mayPyjZ i‡xZ I AvÂywjK evDcfvlv(msÁv, ˆe‡ukó, cy_©K¨ I D`vniY)

L) বাংলা বানান ও উচ্চারণ বিধি ঃ ¯teY©e¨ÄbeY©Ñ h‡ÿ e‡Y©PÑMb ‡KŠkj, bvg,D’PviY I D`vniY; evsjv GKv‡Wgxi c‡ÏZ evbvb i‡xZ RvZxq ik¶¤yg I cWx cÿK ‡evÎwi evbvb i‡xZ; D’PviY i‡xZ I D’Pvi‡Yi mÍ-evsjv D’Pvi‡bi i‡xZ mgn, eÛj c‡ÖjZ wK‡Qyk‡²ái evbvb I D’PviY ebv‡wei Avwie, eÏK‡ c‡Í i c`-c‡ÖqMÐI c` web¨v‡m fÿ, mayl PÿZ iÿZi ukÕYRubZ fÿ |

M) বিরচন ঃ fvenÍÞc‡ÖqiY, miwmk I misgg©c‡ÖZ‡`b iPbv|

N) পত্র রচনা ঃ e¨w³MZ, mgvwRK, `vßwiK, msev c‡Í c‡Ö‡k Dc‡hvMÐy, ¯†iK ÿ‡u½, mvb c‡Í; Avte`b c‡Í--c‡ÏÖZÔwbK, PvKwii Avte`b, Rixbe‡ÖÁ‡Íᔁ BZ¨vw` |

২ **বাংলা সাহিত্য ঃ**

ক) কবিতা

- e½fvlv-- gvBÿ‡Kj gaymyb `Ë
- ‡mbvi Zix-- iex `vy_©WKi
- gvb}-- KvRxbRi'j Bmjvg
- evsjvi gš Avwg f`ulqyÑ-- Rxebvb` `vk

খ) ছোট গল্প ঃ

- ‡L·Kve¤ey c‡Í¨eZÐ --iex¯§WKi
- gtmk -- kir P` ‡PÍU‡cva¨vq
- GKˆki gÍ -- Rvni ivqmb

গ) প্রবন্ধ ঃ

- Aaßx-- ‡eMÐg †ivÔKqvmLvqvZ ‡mtmb
- Rxeb I eÎ¶ -- tgvZvwni ‡mtmb ‡PŠayx
- ms¯wZ - Avej dRj

ঘ) একাঙ্কিকা

gvb*ý -- g*ý*xi †P*Ša*ý*x

0) মুক্তিযুদ্ধের উপন্যাস ঃ **(†h †K\b GK\U)**

- **Av¸†bi c ikg\b- ûg*√q*b A\u†g`**
- **Rbbx*m\u*bx- 1971 --A\u*b\b*ý nK**

১. নির্ধারিত বক্তৃতা ঃ **\u\u*f\b R\uZ\x*q \b'em \u\u*l*q*K -- \u\u*R*q \b'em, GK*ý*k †de*ý*q\ui, A\uš*ÍR*Ä*ZK gvZ\f\ulv\b'em¸ ¯*Ì\a\ubZv\b'em¸ 15 A\u*M÷-RvZ\x*q †k\uK \b'em¸ †g \b'em\|**
c*ÄZ*ô\u\bK e³Zv*Ñ be\uZ \k¶†‡Ki eiY, \u\u`\u\ux*Q\uÎ*‡*` i D†‡*Í†k¨ e³Z\u, \k¶\u\v*g*Š\ý gmc\u*iP\ýj*K/
†P\qui\g*ý*\b Gi A\U\U\gb Dc\ýj†‡¶\| e³Z\u\|

2. আবৃত্তি ঃ

- **e\u\kxx-- i ex`\bv_ \WKi**
- **K\uÛvi\x\u\ñ*k\q\ui -- K\uR\xbR\i'*ý Bn\ý\ug**
- **mvq \uP\ýj--R\x\eb\ub\`¸ `\k**
- **c*ÄZ`\b -- Rmg D\u\ï*b**
- **\u\m* - n\Ä\u\š*Í f\Ä\uP\h©**
- **†Z\vg\uK c\ul\q\ui Rb*¨ n*¯*Ì\ubZv--k\u\gm\ý ingvb**
- **eY*Ä\ýj v A\ug\ui `\ý*kbxeY*Ä\ýj v-k\u\gm\ý ingvb**
- **\u\A\U \u I - gm\f`e mmv\|**

3. বিতর্ক ঃ

- **\u\A\ub A\uk*Ä*©¶ bv A\uf k\uc\|**
- **Q\uÎ i\Rbx\Z \ubq\uš*}B c*Ä*Z.\W*Zš‡c*Ä*Z*ôvi c_\|**
- **B\s†i\uR g\u\u\uä¨g \k¶\u\vc×\uZ RvZ\xqZv†e\uv I †`kt\uc*Ä*ô m*ý*ói c*Ä*b A\uš*Í i\u\q\|**
- **c*Ä\ý*Ä*i \u\eK\ukB c\uÄ\uZ \u\eb\ut\ki GKg*Ä\uÎ K\uiY\|**
- **m¯*Ì*Ä*Z*B A\u\a*b*K g\ub*ý*ý l i ag©¶**
- **g\uý*Ä*h\ýù×i †PZ\ubB A\m*Ä*c\Ü\u\ýq*K e\ucj\u†` k c*Ä*Z*ôvi g\u\jg\uš¸\|**
- **A\uK\uk m¯*Ì*Ä*Z h\uq ngvt\uRi ˆb\uZ*ÍK Ae¶\uk\u\qi g\u\j K\uiY\|**
- **P\uý‡Ki A\m*Z\Ä*Z\ub m\uoK `\ý*Ä*ô\ui c*Ä\ub*Zg K\uiY\|**

4. উপস্থিতি বক্তৃতা ঃ
\u\u\l q*e¯*Ì'Db\ý*∆\|

5. প্রতিবেদন উপস্থাপন ঃ

- **D×*Ä*b KZ*Ä@*ý*‡¶\u\i K\ut\Q\u Dc¯*Ì\u*cb**
- **m\uev c\uÄ*Í c*Ä*Ü\u\ut\ki Rb¨ †c*Ä*ôY**

5811 Social science- I T P C
2 0 2

OBJECTIVES

To provide opportunity to acquire knowledge and understanding on :
-        importance of civics and its relationship with other social sciences
-        the relationship of an individual with other individuals in a society
-        social organizations, state and government
-        rule of law, public opinion and political parties
-        UNO and its roles
-        the basic concepts and principles of economics and human endeavor in the economic system.
-        the realities of Bangladesh economy and the current problems confronting the country.
-        the role of Diploma Engineers in industries.
-        occupations and career planning for Diploma Enginers.

SHORT DESCRIPTION

Civics and Social Sciences; Individual and Society; Nation and Nationality; Citizenship; state and government; Law; Constitution; Government and its organs; public Opinion; Political Party; UNO and its organs;
Scope and importance of Economics; Basic concepts of Economics- Utility, Wealth, consunmption, income wages and salary and savings; Production – meaning, nature, factors and laws; Demand and Supply; Current economic problems of Bangladesh; Role of Diploma Engineers in the economic development of Bangladesh; Occupations and career planning; Engineering teem.

Part-1 (Civics)

1.   **Understand the meaning and scope of civics and inter relations of social sciences.**
        1.1.   Define social science.
        1.2.   State the meaning and scope of civics.
        1.3.   Explain the importance of civics in the personal and social life of an individual.
        1.4.   Describe the relationship of all social science (civics, Economics, political science, sociology, ethics)

2.   **Understand the relationship of the individual with the society, Nationality and nation, Rights and duties of a citizen.**
        2.1   Define the concept (individual, society, Nation, Nationality, citizen and citizenship).
        2.2   State the relationship among the individuals in the society.
        2.3   Differentiate between nation and nationality.
        2.4   Describe the elements of nationality

2.5   Describe the criteria of Bangladesh nationalism.

2.6   Diferentiate between a citizen and an alien.

2.7   Discuss the methods of acquiring citizenship and state the causes of losing citizenship

2.8   Describe the rights of a citizen and state the need for developing good citizenship.

3.   Appreciate the relationship between the state and government, law and organs of government.

3.1   Meaning the state, government and law

3.2   Discuss the elements of state.

3.3   Discuss the classification of the forms of government

3.4   Distinguish between cabinet form of Government and presidential form of government.

3.5   Describe the main organs of Government (legislature, Executive and judiciary)

3.6   Discuss the sources of law

4.   Understand and the classification of constitution

4.1   Explain the deferent form of Constitution

4.2   Explain the merits and demerits of different forms of constitution and state the salient feature of Bangladesh constitution

5.   Understand the importance of the formation of public opinion and the role of political parties in the affairs of state and government.

5.1   Define the public Opinion and political party.

5.2   Explain the importance of public opinion in the modern democratic society.

5.3   Discuss the role of different media in forming public opinion.

5.4   Discuss the importance of political parties in democracy.

6.   Understand the role of UNO in maintaining world peace

6.1   Explain the major functions of UNO.

6.2   State the composition and functions of General Assembly.

6.3   Describe the Composition and functions of security council.

6.4   Discuss the role of Bangladesh in the UNO.