Q.No.  Question                                              M.M.
1(a) Draw the i-v characteristics of a thyristor and explain the following terms:
   i) Latching current
   ii) Holding current
   iii) Forward breakover voltage
   Explain the effect of gate current on forward break over voltage.  
   [06]

1(b) Draw Circuit symbols of DIAC, TRIAC, GTO and LASCIR. What are the advantages and disadvantages of a GTO over an SCR?  
OR

1(b') Draw the structure, circuit symbol and i-v characteristics of a TRIAC. What are the different modes of triggering of TRIAC? Explain the two most commonly used modes.  
   [06]

2(a) What are the main conditions that must be satisfied by triggering circuit of an SCR? With the help of neat sketch and relevant waveforms, explain the working of an R-triggering circuit. What are the drawbacks of this circuit?  
OR

2(a') With the help of neat circuit diagram and relevant waveforms explain the operation of UJT as relaxation oscillator. Find the expression for the frequency of output pulses.  
   [06]

2(b) With the help of neat sketch explain the function of a driver circuit used to trigger an SCR.  
   [06]

3. Draw the circuit of a single-phase bridge converter. Draw the waveforms of the  
   [12]
output voltage and source current. Show that the $n$th harmonic component of the source current is given by

$$I_n = \frac{4I_s}{n\pi} \sin(n\omega t - n\alpha)$$

Where $I_s$ is the magnitude of the ripple-free output current.

**OR**

3' (a) Draw the circuit of a single-phase mid-point converter supplying a resistive load. Draw the waveforms of load voltage and anode to cathode voltages across the thyristors for $\alpha = 90^\circ$. Find the expression of the output voltage.

3' (b) A 24-V battery is charged by a single-phase full-bridge converter with an input supply of 50V. A resistance of 5 $\Omega$ is connected to limit the current. A large inductance is connected in series with the battery to make load current continuous and ripple-free. Find the output power and input power factor for $\alpha = 30^\circ$.

4(a) Draw the circuit of a three-phase half-wave converter (3-pulse converter). If the converter is supplying a purely resistive load, draw the waveform of output voltage for $\alpha = 60$ degrees. Find the expression for output voltage if the firing angle is more than 30 degrees.

4(b) A three-phase fully controlled Bridge converter with source voltage of 220V supplies power to a highly inductive load with a resistance of 20 $\Omega$. For $\alpha = 30^\circ$, find:

(a) average output voltage and current

(b) rms output voltage and current

(c) Average and rms SCR currents

(d) Average output power.

5. With the help of neat sketch and relevant waveforms, explain the cosine firing scheme used for triggering SCRs of a single-phase full wave converter. Show that the output voltage of the converter is directly proportional to the control voltage of the firing circuit.

**OR**

5' What is a dual converter? Draw its circuit and explain its operation both with simultaneous and non-simultaneous control. Compare the two modes of operation.
B.TECH (AUTUMN SEMESTER) EXAMINATION
ELECTRICAL
ELECTRICAL POWER GENERATION AND UTILIZATION
EE-331

Maximum Marks: 60 Credits: 04 Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.
Notations and abbreviations used have their usual meaning.

1(a). Draw water-steam flow diagram of thermal power plant. Also explain working of cooling towers. [6]

OR

1(a'). What is pulverising plant? Explain different type of pulverising mill. Also write its advantages and disadvantages. [6]

1(b) Explain with the help of neat diagram the working of advanced gas cooled reactor. [6]

OR

1(b'). How nuclear waste is disposed and what is the effect of its radiation on humans? Also mention different type of shielding materials. [6]

2(a). Explain various factors responsible for the site selection of hydro power plant. [6]

OR

2(a'). With the help of a diagram explain the speed regulation of a Pelton turbine used in hydro power plant. [6]

2(b). With the help of neat & clean diagram explain different component of closed cycle gas turbine plant. [6]

3(a). What is cogeneration system? Explain with the help of diagram in-plant power generation system. Also explain its different cycle. [6]

OR

3(a'). Explain with the help of diagram the steam turbine and combined cycle cogeneration systems.
3(b) Explain briefly different types of captive power plant.

4(a) Answer the following questions:

I. Prove that in a filament lamp the diameter of filament is directly proportional to $I^{2/9}$, where $I$ is the current flowing in the filament.

II. Enumerate the various factors to be considered while designing street lighting.

OR

4(a') I. Difference between electro-plating and anodizing.

II. Salient features of various types of lighting schemes.

4(b) It is desired to illuminate a hall with an average illumination of about 250 lux. The area of hall is 30m $\times$ 20m. The lamps are to be fitted at 5m height. Find out the number and size of incandescent lamps required for an efficiency of 12 lumens/watt. Utilization factor = 0.4 and maintenance factor = 0.85.

5(a) What is specific energy consumption? Enumerate the factors which affect the specific energy consumption of trains operating at a given schedule speed. Also derive the expression for it.

OR

5(a') Enumerate various types of systems used for track electrification. Discuss the system used in India for main lines, in detail.

5(b) A 220 tonne motor coach having four motors, each developing a torque of 8000N$\text{m}$ during acceleration, starts from rest. If upgrade is 25 in 1000, gear ratio 3.2, gear transmission efficiency 90%, wheel diameter 92cm, train resistance 45N/t, rotational inertia effect 8%, calculate:

i. Time taken by the coach to attain a speed of 72 Km/hr.

ii. If the supply voltage is 3000V and motor efficiency 85%, estimate the current taken by each motor during the acceleration period.
1. a) Explain the working of Successive approximation type DVM. Also draw its block diagram.

OR

a') Which of the DVMs have excellent noise rejection characteristics? Explain with mathematical proof. Also explain its working with the help of block diagram.

b) Explain with the help of the circuit diagram, the principle and working of a digital measurement of Time Period. What is the function of the time base selector?

OR

b') What is Sampling Theorem? What are the conditions for truncation error to be zero in a digital Wattmeter? Explain mathematically.

2. a) Explain the terms TDM and FDM.

b) What are the various types of modulation schemes? With the help of circuit diagram explain how PFM be generated from PWM.

c) With the help of block diagram explain the working of a Data Logger.

OR

c') With the help of block diagram explain the working of a DSO.

3. a) What are the advantages of using electrical transducers? Discuss the loading effect of measuring device on the linearity of a potentiometer.

b) How is LVDT used to measure linear displacements? What are its advantages and disadvantages?

b') What are strain gauges? What are the various types of strain gauges? Derive a relation between the poisons ratio (\(v\)) and gauge factor (\(G_f\)).

Contd. ...
a) What are the various temperature transducers? Explain anyone in detail. 3*4=12
b) Explain with the help of diagram working of a Gyroscope. What are its applications?
c) What is the principle of Hall Effect transducer? What are its advantages and disadvantages?

4. a) What is the principle of total internal reflection. Define the following terms 3*4=12
   OR
   a) Discuss the various light modulation techniques in Optical Fibre sensors.

b) With the help of block diagram, discuss the principle of ultrasonic transducer acting as receiver and transmitter of ultrasonic wave.
c) Discuss inductive transducer for pressure measurement with the help of diagram.

5. Explain any three of the following 3*4=12
   a) Global Positioning System.
   b) MEMS based sensors.
   c) Wide area measurement.
   d) Smart meters.
B.TECH. (AUTUMN SEMESTER) EXAMINATION
ELECTRICAL ENGINEERING
High Voltage Engineering
EE – 361

Maximum Marks: 60
Credits: 04
Duration: Three Hours

Answer all the questions. Assume suitable data if missing. Notations used have their usual meaning.

Q.No.          M.M.

1(a) Distinguish between:
(i) Statistical time lag and Formative time lag.
(ii) Primary ionization coefficient and Attachment coefficient.

1(b) Discuss Streamer theory with suitable figures for breakdown in gases under uniform field conditions. Also explain the limitations of Townsend's theory.

1(c) What are the various impurities present in commercial liquids? Explain the liquid insulation purification system with a suitable diagram.

OR

1'(a) Give reason(s) for the following:
(i) High soda content glass insulator should be avoided in moist and damp condition.
(ii) SF6 gas has higher breakdown strength than air.
(iii) Class A insulation has higher operating temperature limit than Class Y insulation.

1'(b) Define Townsend’s primary and secondary ionization coefficients and hence derive Townsend’s breakdown equation of a gas under uniform fields. Also state the conditions under which Townsend’s and Streamer theory are applicable.

2(a) What are the characteristic requirements of a HV testing transformer? Explain cascade connection of testing transformers for generating 1050 kV at 50 Hz.

Contd...2.
(b) Define standard lightning impulse and switching surges as per Indian standards. Develop expressions for wave-front and wave-tail time using approximate analysis of basic Marx circuit.

OR

2(a) With the help of a circuit diagram explain the working of a multistage impulse generator. Also explain with suitable figure the Trigatron spark gap.

(b) With the help of a neat sketch explain the working of Van de Graaff generator for generating high dc voltages. What are the advantages and limitations of this method?

3(a) Discuss uniform field electrode spark gap method used for measurement of high voltages. Also discuss the effect of humidity and nearby earthed objects on the measurements using sphere gap method.

(b) Explain the working of Generating Voltmeter for the measurement of high dc voltages. What are its advantages and limitations?

OR

(b') Explain the working of Electrostatic voltmeter for the measurement of high rms voltages. What are its advantages and limitations?

4(a) Differentiate between loss tangent and loss index as applied to testing of electric insulation. Also explain a suitable method for measurement of loss tangent of insulation.

(b) With the help of a neat sketch explain the recurrence of partial discharges in solid insulation when subjected to ac voltages. What are the adverse effects of partial discharges on solid insulation?

(c) Draw an analogue circuit and hence determine the expression for PDIV for discharge in interfaces.

5(a) Why dielectric thermal resistance test is performed on a cable?

(b) What is Condition Monitoring? With the help of an example explain how it is implemented.

(c) What are the different tests performed on overhead line insulators? Explain 50% impulse flashover test and pollution test performed on line insulators.
B. TECH. (AUTUMN SEMESTER) EXAMINATION
(ELECTRICAL, CHEMICAL, PETROCHEMICAL, COMPUTER)
ECONOMICS AND MANAGEMENT
ME 340

Maximum Marks: 60  Credits: 04  Duration: Three Hours

Answer all the questions.
Assume suitable data if missing.

1. a. Differentiate between luxuries and necessities. 03
   b. What is a price demand supply relationship? Explain how the addition of
      supply for a given demand will establish a new and lower price. 03
   c. An engineer has two bids for an elevator to be installed in a new building. The
      details of the bids for the elevators are as follows:

      | Bids          | Initial cost (Rs.) | Service life (years) | Annual operations & maintenance cost (Rs.) |
      |---------------|--------------------|----------------------|-------------------------------------------|
      | Alpha Elevator Inc. | 4,50,000          | 15                   | 27,000                                    |
      | Beta Elevator Inc.     | 5,40,000          | 15                   | 28,500                                    |

      Determine which bid should be accepted, based on the present worth method of
      comparison assuming 15% interest rate.

   OR

1'. c' A cement plant plans to open a new rock pit. Two plans have been devised for
movement of raw material from quarry to the plant. Plan A requires the
purchase of an earth mover and the construction of an unloading pad. Plan B
calls for construction of a conveyer system from the quarry to the plant. The
expected costs are as follows:

<table>
<thead>
<tr>
<th>PLAN A</th>
<th>PLAN B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase Price ($)</td>
<td>Mover</td>
</tr>
<tr>
<td>45000</td>
<td>28000</td>
</tr>
<tr>
<td>Annual Operating Cost ($)</td>
<td>6000</td>
</tr>
<tr>
<td>Salvage Value ($)</td>
<td>5000</td>
</tr>
<tr>
<td>Life (Years)</td>
<td>4</td>
</tr>
</tbody>
</table>

   Which plan should be selected for an interest rate of 15% per year?

2. a. Differentiate between book value and market value. How does depreciation
affect a company's cash flow?
   Given the data below, find the depreciation and book value in year 3, using a
double declining balance method:
   First cost: Rs. 400,000
   Salvage Value: Rs. 75,000
   Life: 5 years

   OR

Contd....2.
a' What are the various criteria for performing a cost benefit analysis? Five interdependent proposals are under consideration for a particular project. The present worth of capital requirement and benefits for each proposal are as follows:

<table>
<thead>
<tr>
<th>Alternative</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>PW of Capital (Rs.)</td>
<td>80,000</td>
<td>50,000</td>
<td>72,000</td>
<td>43,000</td>
<td>81,000</td>
</tr>
<tr>
<td>PW of Benefits (Rs)</td>
<td>70,000</td>
<td>55,000</td>
<td>76,000</td>
<td>52,000</td>
<td>84,000</td>
</tr>
</tbody>
</table>

Develop an incremental B/C ratio analysis and select the appropriate alternative.

b Define the terms economic life and useful life of an asset. Two years ago, a machine was purchased at a cost of Rs. 2,00,000 to be useful for eight years. Its salvage value at the end of its life is Rs. 25,000. The annual maintenance cost is Rs. 25,000. The present market value of the existing machine is Rs. 1,20,000. A new machine, with a service life of 6 years, is now available at Rs. 1,50,000. Its annual maintenance cost is Rs. 14,000. The salvage value of the new machine is Rs. 20,000. Using an interest rate of 12%, find whether it is worth replacing the present machine with the new machine.

3 a Discuss the social responsibilities of an organisation. What are the arguments for and against social responsibility of organisations?

b What are the advantages of group decision making. Differentiate between Delphi and Nominal group decision making techniques.

4 a What do you understand by organizational planning? Differentiate among tactical and operational plans.

b Describe the five alternatives to job specialization. What is the advantage of each, as compared to specialization?

OR

4' a How is leadership different from management? Give suitable example to distinguish between them.

b What are various levels of control system in an organization? Explain the four fundamental steps of any control process.

5 a Describe the four basic levels of international business activity. Do you think any organization will achieve the fourth level? Why or why not?

b Describe the processes of human resource planning, recruiting and selection.

OR

5' a What do you understand by marketing mix or 4P’s of marketing?

b Explain the difference between macroeconomics and microeconomics in the context of financial management.