Instructions:  
(1) All questions are compulsory. 
(2) Illustrate your answers with neat sketches wherever necessary. 
(3) Figures to the right indicate full marks. 
(4) Assume suitable data, if necessary. 
(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall. 
(6) Preferably, write the answers in sequential order.

1. A) Attempt any three: 
   a) Compare a group drive and an individual drive. 
   b) State various applications of dielectric heating. 
   c) Define the following terms: 
      i) Luminous Intensity 
      ii) Lumen 
      iii) Candle power 
      iv) Waste light factor. 
   d) Explain any three disadvantages of low power factor and state three methods to improve it.

   B) Attempt any one: 
   a) What is electrical braking? Explain regenerative braking for D.C. series motor. 
   b) Describe any two methods of current flow control in welding transformers.

2. Attempt any four: 
   a) What is load equalization? Explain with neat diagram and graphs, the process of the load equalization. 
   b) State the principle and application of eddy current heating. 
   c) Compare AC and DC system of traction. 
   d) Write any eight desirable characteristics of traction motors. 
   e) State the difference between actual speed and schedule speed of train. State the factors affecting schedule speed of a train.

3. Attempt any two: 
   a) A motor has to perform the following duty cycle: 
      1) Load rising from 200 kW to 500 kW in 4 minutes. 
      2) Uniform load of 350 kW for 2 minutes. 
      3) Regenerative braking power returned to supply from 150 kW to zero in 2 minutes. 
      4) Remains ideal for 1 minute. Determine power rating of motor. 
   b) A 50 kW, three phase, 440 V resistance oven is to provide nickel-chrome strip 0.3 mm thick, for the three-star connected heating elements. If the temperature of the wire is to be 1500° C and that of the charge is to be 1000° C, calculate a suitable width of the strip. Take emissivity as 0.91 and radiation efficiency as 0.6. The specific resistance of nichrome alloy is $1.016 \times 10^6$. What would be the temperature of the element, when charge is cold at 20° C? 
   c) What are the different safety and protective devices used in elevators? Also state functions of each device.

P.T.O.
4. A) Attempt any three:
   a) Write classification of electric welding and its advantages.
   b) Explain the operating principle and working of a fluorescent lamp. Mention the function of the following components:
      i) Electrodes  ii) Choke
      iii) Capacitor in glow type starter.  iv) Capacitor connected across input terminals.
   c) Write short notes on the following:
      i) Two part tariff.  ii) Power factor tariff.
   d) Derive an expression for the most economical value of power factor.

B) Attempt any one:
   a) With the help of neat sketch explain construction and working of spot welding machine.
   b) The monthly reading of a Consumer’s meter are as follow:
      Maximum demand = 50 kW
      Energy consumed = 36,000 kWh
      Reactive energy = 23,400 KVAR.
      If the tariff is Rs. 80 per kW of maximum demand plus 8 paise per unit plus 0.5 paise per unit for each 1% of power factor below 86%, calculate the monthly bill of the consumer.

5. Attempt any four:
   a) Draw the following types of lamp fittings and lighting systems with the help of light distribution graphs and its applications.
      i) Direct lighting  ii) Indirect lighting
      iii) Semi-direct lighting  iv) Semi-indirect lighting.
   b) Describe carbon arc welding with neat sketch.
   c) What are the requirements of ideal traction system? What are the different traction systems?
   d) Draw a neat diagram of A.C. electric locomotive and explain function of each part in it.
   e) With a suitable diagram explain series-parallel control of D.C. series motor.

6. Attempt any two:
   a) Describe the core type (Ajay Wyatt) induction furnace with a neat sketch and state its application and advantages.
   b) The speed-time curve of a train consists of:
      i) Uniform acceleration of 5 km phps for 30 Sec.
      ii) Free running for 10 min.
      iii) Uniform retardation of 6 km phps to stop the train.
      iv) A stop time of 5 min.
      Find the distance between the stations, the average and schedule speed.
   c) A 3-phase, 50 Hz, 400 V motor develops 100 HP, the power factor being 0.75 lagging and efficiency 93%. A bank of capacitors is connected in delta across the supply terminals and power factor raised to 0.95 lagging. Each of the capacitance unit is built of four similar 100 V capacitors. Determine the capacitance of each capacitor.