REF. NO. : EX/PE/PE/H/T/414B/2024

NAME OF THE EXAMINATION: B.E. POWER ENGINEERING FOURTH YEAR FIRST SEMESTER - 2024

SUBJECT: ELECTRIC POWER AUTOMATION AND UTILIZATION (HONS.)

TIME: 3 HOURS FULL MARKS: 100

**USE SEPARATE ANSWER SCRIPTS FOR PART A AND PART B**

## PART A

Answer *any five (5)* questions

| | | | |
|---|---|---|---|
| 1. | Write short notes on:<br>a) DA reliability<br>b) DA security | (10) | [CO1] |
| 2. | Discuss electric power distribution topology and structure. | (10) | [CO1] |
| 3. | Discuss some classical approaches used for solving fault detection problems in Distribution Automation. | (10) | [CO1, CO5] |
| 4. | Discuss any two Voltage control methods. | (10) | [CO1] |
| 5. | Write a brief discussion on "Use of AI techniques for Fault Analysis" | (10) | [CO1] |
| 6. | Discuss SCADA System Functions for DMS. | (10) | [CO1, CO5] |
| 7. | Discuss about implementation of "AI techniques in Demand Side Management (DSM)" | (10) | [CO1] |

## PART B

Attempt *ALL* questions

**Q1.** ***Choose the correct option for any ten (10) questions:*** (10@1 = 10)

(i) In the case of immersion type water heater, the heat is transferred by: [CO2]
- a) radiation
- b) conduction
- c) convection
- d) all of the above methods

(ii) Inflammable articles like plastic and wooden products etc. can be safely heated by using _____ heating. [CO2]
- a) eddy-current
- b) induction
- c) dielectric
- d) resistance

(iii) The electric arc during welding has: [CO2]
- a) Linear resistance characteristic
- b) Negative resistance characteristic
- c) Positive resistance characteristic
- d) Highly inductive characteristic

(iv) In direct arc furnace, which of the following has high value? [CO2]
- a) current
- b) voltage
- c) power factor
- d) all of the above

(v) In Electroplating process, the object undergoing surface plating works as _____ [CO3]
- a) Anode
- b) Cathode
- c) Depends upon the metal to be coated
- d) Depends upon the nature of supply source

(vi) The spongy coating of electroplating speaks of [CO3]
- a) Higher current density
- b) Poorer electrolyte density
- c) Excessive electrolyte density
- d) Lower current density

(vii) Candela is the unit of [CO3]
- a) light
- b) luminance
- c) illumination
- d) luminous intensity

(viii) The rate of evaporation of tungsten filament in a lamp depends upon [CO3]
- a) Glass shell diameter
- b) Vapor pressure inside the bulb
- c) Exhaust tube diameter
- d) All of the above

(ix) The most vital factor against electric traction is: [CO4]
- a) The necessity of providing negative booster
- b) High initial cost in laying out overhead electric supply system
- c) Its high maintenance cost
- d) The possibility of power failure

(x) The free-running speed of a train does NOT depend on the [CO4]
- a) duration of stops
- b) distance between stops
- c) acceleration
- d) running time

(xi) Which of the following braking systems of the locomotives is costly? [CO4]
a) Vacuum braking on steam locomotives
b) Vacuum braking on diesel locomotives
c) Regenerative braking on electric locomotives
d) All braking systems are equally costly

(xii) The current collector which can be used at different speeds under all wind conditions and stiffness of OHE is called _____ collector [CO4]
a) bow
b) messenger
c) pantograph
d) trolley

**Q2 Answer any TWO (2) questions [5×2=10] [CO2]**

(a) List the properties of a good heating element used for electric heating. List the different materials used as heating elements.
(b) Briefly describe the principle of induction heating at high frequency and highlight a few applications of eddy current heating.
(c) What is the importance of proper arc length in metal arc welding? What are the demerits of long arc length?

**Q3 Answer any TWO (2) questions [5×2=10] [CO3]**

(a) What is electro-deposition? Explain the various factors that affect the quality and appearance of the deposited surface.
(b) Explain with sketches the constructional features of a tungsten filament lamp.
(c) Discuss the inverse square law and the cosine cube law of illumination.

**Q4 Answer any TWO (2) questions [5×2=10] [CO4]**

(a) What are the various systems of track electrification? Highlight their relative advantages and limitations.
(b) With a neat sketch, draw and explain the equipment and accessories present in a modern AC traction locomotive engine.
(c) Discuss in brief, the general architectures of Hybrid Electric Vehicles

**Q5 Answer any TWO (2) questions [5×2=10] [CO5]**

(a) A 40-kW, 3-phase, and 400-V resistance oven is to employ Ni–Cr strip of 0.3 mm thickness. The heating elements are star commuted. If the temperature of the wire is to be 1200°C and that of the charge is 700°C. Determine the length and width of the wire. Take the radiation efficiency 0.5 and the emissivity as 0.9. Take the specific resistance of Ni–Cr = $1.03\times10^{-6}$ Ω-m.
(b) Two sources of luminous intensity 200 candela and 250 candela are mounted at 8m and 10m respectively above floor. Horizontal distance between the lamp posts is 40m. Calculate the illumination on floor at the middle of the two posts.
(c) A suburban train runs with an average speed of 36 kmph between two stations 1.8 km apart. Values of acceleration and retardation are 1.8 km/hr/s and 3.6 km/hr/s respectively. Calculate the maximum speed, acceleration period and braking period.