

6TH SEM ./ ELECTRICAL/ELE & MECH / 2023(S)

TH1 ELECTRICAL INSTALLATION AND ESTIMATING

Full Marks: 80

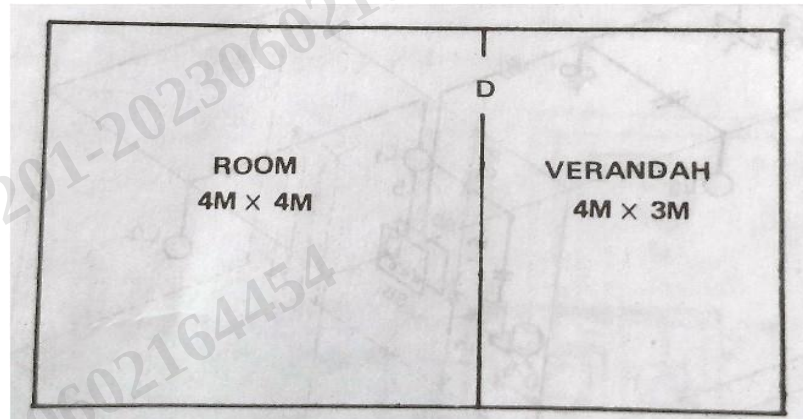
Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define (i) Open Sparking (ii) Concentric Cable.
 - b. Write any two important properties of Glass Insulators used in transmission lines.
 - c. State the Rule 34 of Accessibility of bare conductor of Indian Electricity Rules.
 - d. How Pig tail joint is made between two solid conductors?
 - e. State any two advantages of PVC casing and capping wiring system.
 - f. Name any two types of methods of earthing.
 - g. What are the factors governing height of poles?
 - h. Expand the abbreviation of GI, TPIC, TRS, and RCCB used in electrical estimation.
 - i. What is the declared voltage and frequency of supply to consumer as per IE rules?
 - j. Define (i) Wire splicing (ii) Bird Guards
2. Answer **Any Six** Questions 6 x 5
 - a. Explain briefly about the different schemes of lightening.
 - b. Describe briefly about pipe earthing with a neat diagram.
 - c. Explain the construction and working of ELCB briefly.
 - d. Explain about the Sodium Vapour lamp briefly with a neat diagram.
 - e. Explain about the installation of service line for low roof or single storeyed building briefly.
 - f. Write a short note on shackle insulators in overhead lines with a neat diagram.
 - g. Describe about voltage grading and general specification of cables.
3. 10

A room and a verandah, the plan of which is given below is required to be provided with electrical wiring. Mark the location of energy meter, main switch and switch board and electrical points suitably and draw the installation plan showing supply path to each point and wiring diagram. Calculate the total length of wire required for wiring the room and verandah in batten system of wiring. Assume: Total height of ceiling= 3.5 mts. Height of HR from floor=3.0 mts, Height of SB from floor=1.5 mt.

Location of energy meter and main switch board =0.5 mt. inside verandah on room wall.



- 4 Describe about all types of lighting schemes with their advantages and applications in details. 10
- 5 Draw a labelled sketch diagram of pole mounted substation of capacity 50kva transformer of rating 11/0.4 KV, showing disc insulators, TPMO, fuse set, danger plate, stay wire, earthing clearly. 10
- 6 An overhead distribution line of 415volts,3phase,50Hz is to be erected along straight route.The length of the line is 300 meters and the end supports are terminal structures. 10
The span between adjacent poles is 50 meters.Draw a neat sketch of the terminal pole showing all the 3 phases, neutral, earth wire, street light wire. Phase wire-hard drawn bare copper wire no. 4 SWG. Neutral and street light wire- hard drawn bare copper wire no. 8 SWG. Earth wire-GS wire no. 8 SWG. Estimate the quantity of material required for the line.
- 7 There are four light/power sub circuits in an installation of a house wiring as follows: 10
No. 1 Sub-Circuit: Light points-2nos., Fans-2 nos., 5A Socket-4 nos.
No. 2 Sub-Circuit: Light points-5nos., Fans-2 nos., 5A Socket-2 nos.
No. 3 Sub-Circuit: Light points-2nos., Fans-3 nos., 5A Socket-2 nos.
No.4 Sub-Circuit: 15A Socket-2 no (1000W).
Assuming each fan is of 80W, each light is of 40W,each 5A socket is of 60W and supply voltage is 230V.Calculate the Total load in amperes assuming unity power factor. Also draw the single line diagram showing cut-out, energy meter, main switch board, and main distribution board.

TH-2 Switchgear & Protective Device

Full Marks: 80

Time- 3 Hrs

**Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks**

1. Answer **All** questions 2 x 10
 - a. What are the types of bus-bar arrangements?
 - b. What is symmetrical fault?
 - c. What are factors in which arc resistance depend?
 - d. What is fusing current and fusing factor?
 - e. What is inverse-time relay?
 - f. What is Merz-price circulating current scheme?
 - g. What is surge absorber?
 - h. What is Instantaneous over current relay?
 - i. What are the important relays and system used for transformer protection?
 - j. What is short-circuit KVA ?

2. Answer **Any Six** Questions 6 x 5
 - a. If the percentage reactance of an element is 20% and full load current is 50 A, then find the short circuit current.
 - b. Explain different method of arc extinction?
 - c. Explain semi-enclosed rewirable fuse and also write its limitation?
 - d. Explain the operation of induction type directional power relay.
 - e. Explain with neat diagram the Balanced earth fault protection of alternator.
 - f. Define and explain the mechanism of lightning discharge.
 - g. Explain the principle of IDMT relay.

- 3 A 3-phase transmission line operating at 10 kV and having a resistance of 1Ω and reactance of 4Ω is connected to generating station bus –bars through 5 MVA step up transformer having reactance 5%. The bus-bars are supplied by 10 MVA alternator having 10% reactance. Calculate the short circuit KVA fed to symmetrical fault at the load end of transmission line and at the high voltage terminals of transformer. 10
- 4 Explain the operation of Sulphur Hexa-fluoride (SF_6) circuit breaker with diagram and write the advantages and limitations of SF_6 circuit breaker. 10
- 5 Explain with the help of neat diagram the construction and working of Differential relay. 10
- 6 Explain the operation of Buchholz relay with neat diagram and also write its advantages and disadvantages. 10
- 7 Write short notes on: 10
- (a) Horn-gap lightning arrester
 - (b) Rod-gap lightning arrester

6TH SEM ./ELECTRICAL / 2023(S)
TH-3 Control System Engineering(CSE)

Full Marks: 80

Time- 3 Hrs

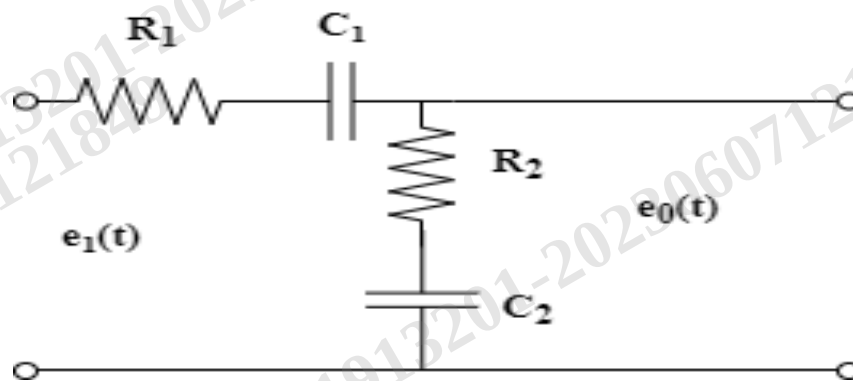
Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks& Use Calculator

1. Answer **All** questions 2 x 10

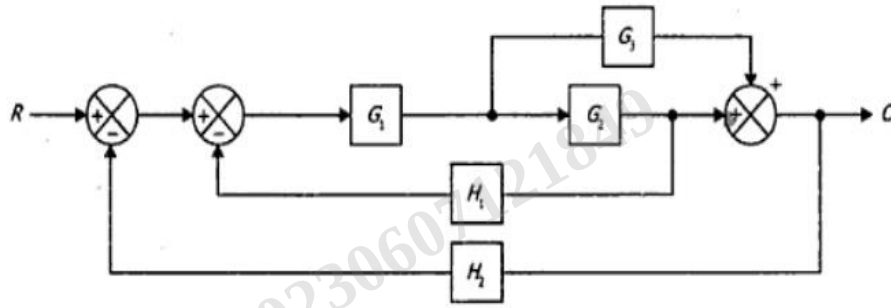
- a. How do you define Transfer Function?
- b. Define Signal Flow Graph (SFG) & write two properties of SFG.
- c. Write the effect of Negative feedback in control system.
- d. How do you mean by **Order** and **Type** of a system?
- e. Define unit impulse function.
- f. What is the main objective of Root-Locus analysis Technique?
- g. How do you define relative stability?
- h. Write the effect of adding poles to closed loop control system.
- i. Give two disadvantages of closed loop control over open loop control system.
- j. Define Peak Time.

2. Answer **Any Six** Questions 6 x 5

- a. Derive the expression for peak time and setting time for the under damped second order system with unit step input.
- b. Obtain the Transfer Function for the given electrical system

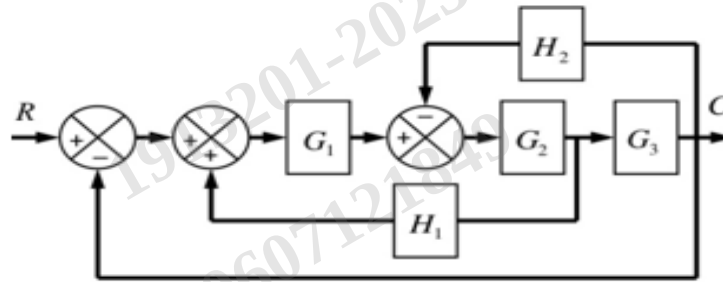


- c. Explain details of PID controller used in control system.
- d. Obtain the Transfer Function of a given system using Block Diagram Reduction Technique.



- e. Explain details of Nicholas Chart used in control system.
- f. State difference between open loop and closed loop control system.
- g. Write short note on Constant M and N circle in brief.

3. Describe construction and working principle of Synchros and also explain how it is used in servo application. 10
4. Draw the signal flow graph for the given system block diagram and obtain the closed loop transfer function of the system $C(S)/R(S)$ using Masson's gain formula 10



5. Sketch the Root-Locus of the system whose transfer function is given by 10

$$G(s)H(s) = \frac{K}{s(s+2)(s+4)}$$

6. Describe with neat block diagram the working of armature controlled DC motor as a control system. 10

7. The open loop transfer function of the plant is 10

$$G(s)H(s) = \frac{80(s+5)}{s^2(s+50)}$$

Use Bode Plot, Find the Gain Margin and Phase Margin.

6TH SEM . / ELECT./ EE(I & C)/ 2023(S)

TH4 Testing & Maintenance of Electrical Machines

Full Marks: 80

Time- 3 Hrs

**Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks**

1. Answer **All** questions 2 x 10
 - a. What do you mean by BDV test of transformer oil?
 - b. What do you mean by drying out of transformer?
 - c. What is the SI unit of (i) Inductive Reactance (ii) Capacity of Battery System?
 - d. Why back emf is zero in DC motors at starting?
 - e. Define (i) OLTC in transformer (ii) TSM in relays.
 - f. What is ratio error in instrument transformer?
 - g. State any two advantages of preventive maintenance.
 - h. Define (i) Lightning Arrestor (ii) neutral Earthing
 - i. Which starter are required to start i) DC Shunt motor ii) 3 phase induction motor?
 - j. What is the function of conservator in transformer?
2. Answer **Any Six** Questions 6 x 5
 - a. What are the precautions to be taken while drying out of motor?
 - b. Describe the overload protection of Power Transformer in brief.
 - c. Which safety procedures are to be followed during erection of substation equipment?
 - d. Explain about the preventive maintenance schedule of SF₆ Circuit breaker used in substations briefly.
 - e. Describe the characteristics of oil used in transformers.
 - f. Explain about the wiring of AC 3-phase induction motor briefly.
 - g. Write a short note on Bus bar earthing connections along with the safety precautions taken for it.
3. Describe the generalized procedure of installation of Electrical Machines. 10
4. Write short notes on (i) Over current protection of Transformer (ii) SF₆ circuit breaker. 10
5. Describe the (i) Receipt and storage ii) Civil works (iii) Foundations in installation of outdoor circuit breakers briefly. 10
6. Explain about the Preventive Maintenance of Power Transformers in Substation. 10
7. With the help of a neat diagram, explain the general requirements of layout of indoor substation in details. 10

6TH SEM. / ELECTRICAL / 2023(S)

TH4 Renewable Energy

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define (i) Solar PV Array (ii) Non-renewable energy
 - b. What are the applications of biodiesel?
 - c. How the speed of wind turbines is controlled by Yaw control mechanism?
 - d. What are the importance of renewable sources of energy.
 - e. Write an example of (i) Line focus (ii) Point focus solar collectors?
 - f. Define solar irradiance and state its SI unit.
 - g. Name any two types of biogas digester.
 - h. What are the characteristics of wind power plant?(any two)
 - i. What do you mean by Hybrid Energy system? Give an example.
 - j. What is wood gasifier?
2. Answer **Any Six** Questions 6 x 5
 - a. Describe about the Maximum Power Point Tracker (MPPT) briefly with a neat diagram.
 - b. Explain the characteristics of induction generator making it suitable for use in wind turbines.
 - c. Describe the thermo-chemical process of pyrolysis briefly.
 - d. What are the advantages of anaerobic digestion?
 - e. Explain about the barrage tidal power systems briefly.
 - f. Write a short note on sustainable design and development.
 - g. Explain the double output system associated with wind turbines with a neat diagram.
3. Write a short note on (i) Combustion And Fermentation (ii) Liquid flat –plate solar collector 10
4. Describe the method of Ocean Thermal Energy Conversion (OTEC) and its types with a neat diagram. 10
5. Write a short note on (i) Solar Charger (ii) Vertical Axis Wind Turbine 10
6. Explain the pitch angle control and Stall (α) control mechanisms of wind turbine control systems in details. 10
7. Explain the present scenario of conventional and renewable sources of energy in India and World. 10