

6TH SEM./EME/ ELECTRICAL / 2022(S)

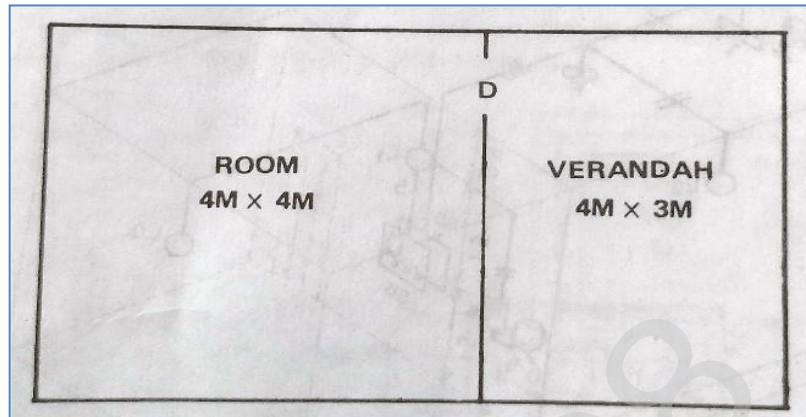
TH1 ELECTRICAL INSTALLATION AND ESTIMATING

Full Marks: 80

Time- 3 Hrs

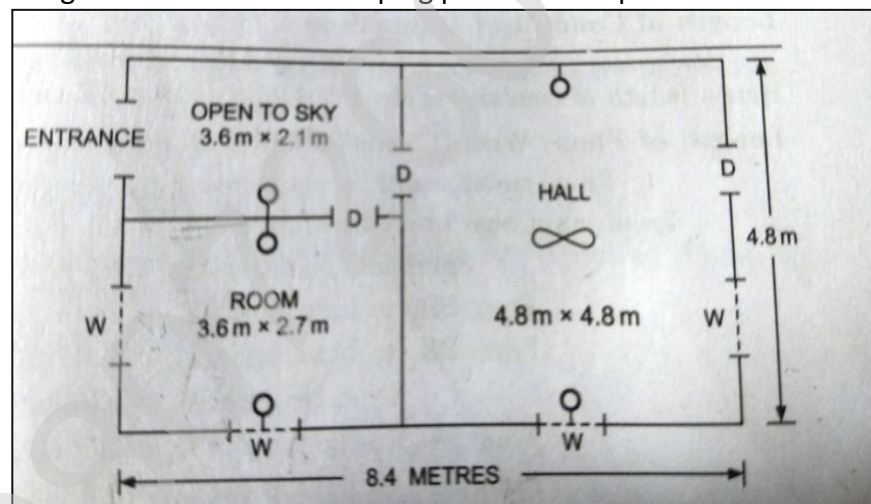
Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Name any two types of methods of earthing.
 - b. Write any two important properties of ACSR conductors used in transmission lines.
 - c. State the Rule 31 of Cut-out premises in general safety precautions of Indian Electricity Rules.
 - d. How Britannia straight joint is made between two bare wires?
 - e. State any two accessories of conduit wiring system.
 - f. Define (i) Depreciation factor (ii) Luminous flux in illumination.
 - g. Name the material of filament and gas used in halogen lamp.
 - h. Expand the abbreviation of ACSR, TPIC, TRS, and MCCB used in electrical estimation.
 - i. What is the declared voltage and frequency of supply to consumer as per IE rules?
 - j. Define(i)Black conduit (ii) Bird Guards
2. Answer **Any Six** Questions 6 x 5
 - a. Explain about the installation of service line for low roof or single storeyed building briefly.
 - b. Draw a neat labelled sketch diagram of plate earthing.
 - c. Explain the construction and working of RCCB briefly.
 - d. Explain about the High Pressure Mercury discharge lamp briefly with a neat diagram.
 - e. Describe the qualities and applications of PVC insulated wires.
 - f. Write a short note on Steel towers used for supporting transmission lines.
 - g. What are the differences between concealed conduit wiring and TRS wiring?
3. 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. 10



4 Explain the sequences to be followed in carrying out the estimate of domestic electrical installations (from drawing installation plan to preparing material table) in details. 10

5 Draw the electrical circuit and calculate the length of PVC Casing-Capping, phase & neutral wire for the wiring used in a house, the plan of which is given below. Assume the height of ceiling as 3.6 meters and one plug point is to be provided in each room. 10



6 In a city locality, an overhead distribution line of 400 volts, 3 phase, 50 cycles/sec is to be erected along a straight route on steel tubular poles. The length of the line is 500 meters and the line terminates at the end. Make a neat sketch of a tubular pole with 3-phase wires, earth wire, neutral wire and street light conductor, shackle insulators, reel insulator cable box, stay wire etc. and estimate the quantity of material required for installing the distribution line with full specification of each item. Size of ACSR conductors, for all types of wires, is 6/1x2.11 (squirrel conductor), Weight of ACSR conductor=85kg/km, Earth wire Galvanized steel is of 8 SWG, Weight of earth wire=10mts/kg, Line Sag=2% 10

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-3 nos.

No.4 Sub-Circuit: 15A Socket-1 no (1000W).

Assuming each fan is of 70W, 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.

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TH-2 Switchgear and Protective Devices

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) TSM(ii) Symmetrical fault
 - b. State any two important faults that occur on an alternator.
 - c. What is the use of distance relay?
 - d. What are the factors on which RRRV (rate of rise of restriking voltage) in circuit breaker depends?
 - e. What are the desirable characteristics of fuse element?
 - f. State any two advantages of static relay.
 - g. A fuse wire of circular cross-section has a radius of 0.8 mm. The wire blows off at a current of 8A. Calculate the radius of the wire that will blow off at a current of 1A.
 - h. What is the function of surge absorber?
 - i. Define(i) Short circuit kVA (ii) Recovery voltage
 - j. Write any two advantages of valve type lightning arrester.

2. Answer **Any Six** Questions 6 x 5
 - a. What steps to be taken for the maintenance of oil circuit breakers?
 - b. Write a short note on High voltage fuses.
 - c. A 3-phase, 20 MVA, 10 kV alternator has internal reactance of 5% and negligible resistance. Find the external reactance per phase to be connected in series with the alternator so that steady current on short-circuit does not exceed 8 times the full load current.
 - d. Explain the protection of switchgear against lightning using overhead ground wires briefly.
 - e. Write a brief note on plain break oil circuit breaker with a neat diagram.

- f. How time-graded protection of a radial feeder can be achieved using definite time relays and inverse time relays?
- g. Describe about the Earth fault or Leakage protection of 3 phase transformer.

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| 3 | Explain about the construction and operation of Buchholz relay in transformer with neat diagram. | 10 |
| 4 | With the help of neat diagram, describe the construction, working of Vacuum circuit breakers and also write its advantages. | 10 |
| 5 | Write a brief note on i) Horn-gap arrester ii) Percentage differential relay. | 10 |
| 6 | Explain about the construction and operation of Induction type Directional power relay with a neat diagram | 10 |
| 7 | Describe the differential protection of Alternators using Merz-Price circulating scheme in details. | 10 |

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TH-3 Control System Engineering

Full Marks: 80

Time- 3 Hrs

Answer any **FIVE** Questions including Q No.1& 2
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1. Answer **All** questions 2 x 10
 - a. What is signal flow graph?
 - b. Define phase margin. Is it positive or negative for stable feedback systems?
 - c. What do you mean by velocity error constant?
 - d. Define (i) Gain cross over frequency (ii) Resonant frequency, in frequency domain analysis.
 - e. What is the time response to unit ramp input in first order system?
 - f. What is corner frequency in Bode plot?
 - g. Define (i) Impulse signal (ii) Transfer function.
 - h. What are the open loop poles of $G(s).H(s) = \frac{12(s+1)}{s(s+4)(s+5)}$?
 - i. What do you mean by all pass system?
 - j. What are the advantages of polar plot?
2. Answer **Any Six** Questions 6 x 5
 - a. Explain the effects of feedback in a closed loop control system.
 - b. What are the basic properties of signal flow graph?
 - c. Derive the damped natural frequency from the time response of second-order system to the unit step signal.
 - d. Describe about the PI controller using Block Diagram briefly.
 - e. Write a brief note on Constant-M circles with the help of polar plot.
 - f. An unity feedback control system has an open loop transfer function:
 $G(s) = \frac{K}{s(s^2 + 4s + 13)}$. Find the (i) Centroid of asymptotes (ii) Breakaway point.
 - g. Explain the effect of addition of poles and zeros to $G(S).H(S)$ on the shape of Nyquist plot.
3. Explain all the rules for reduction of Block diagram, used in control systems in details. 10
4. Explain about the Nicholas Chart used in frequency response analysis briefly. 10
5. Describe about the construction and working of AC servomotors in details with the help of a neat diagram. 10
6. Describe the properties, advantages, disadvantages of transfer function in details. 10
7. Derive the expression for rise time, peak time, peak overshoot for second order systems 10

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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 is circuit breaker?
 - b. State the provisions of fire protection of transformer.
 - c. How insulation resistance is checked?
 - d. Why starter is used in DC motor?
 - e. Write any two differences between indoor and outdoor substation.
 - f. What is an instrument transformer? Give an example.
 - g. Define maintenance? State its types.
 - h. What do you mean by BDV test of transformer oil?
 - i. Which starters are used to run 3-phase induction motors?
 - j. Why earthing of transformer tank and cover is required?

2. Answer **Any Six** Questions 6 x 5
 - a. What are the advantages of preventive maintenance?
 - b. What is breather? Explain charging process of a breather.
 - c. Explain about the civil construction feature for installation of a transformer.
 - 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. Write a short note on wiring of electric motors.
 - 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 Prepare a maintenance schedule of Transformer and Batteries in substation. 10

- 5 Explain briefly about installation of outdoor Circuit breaker. 10

- 6 How filling of oil and drying out process take place for a transformer? 10
- 7 With the help of a neat key diagram, explain the general requirements of layout of indoor substation in details. 10