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15EE651

Sixth Semester B.E. Degree Examination, June 2018
(ELECTRICAL & ELECTRONICS ENGINEERING)
COMPUTER AIDED ELECTRICAL DRAWING

Time: 3 Hours   Max. Marks: 80

Instruction:

1. Answer Question 1 or 2 and 3 from PART-A.

2. Answer Question 4 or 5 from PART-B.

3. Use of CAD tool that satisfies that requirement of the syllabus is permitted. Suitable data may be assumed if not given.

PART – A

1. Draw wave winding (progressive) for an armature having 36 conductors accommodated in 18 slots. Show on the developed winding diagram, the poles, polarity of poles, direction of rotation of the armature, direction of emf induced/current in the conductors, sequence diagram, and position & polarity of brushes.   (25 Marks)

OR

2. Draw the developed winding diagram of an AC machine having the following details.
    No. of poles: 4
    No. of phase: 3
    Phase spread: 600
    Phase sequence: RYB
    No. of slots = 24
    Type of winding: mush.   (25 Marks)

3. Draw the Single line Diagram of a typical substation having the following equipment.
    a) Incoming lines:66kV, 50 Hz, Two
    b) Outgoing lines:66kV, 50 Hz, one
        1kV, 50 Hz, Eight
    c) Transformer: 66/11kV, 3 phase, Δ / Δ, Two
    d) Auxiliary station transformer: 500kVA, 11kV/400V, Δ / Y, One.
        Show the positions of CT, PT, Isolating Switches, Lightning arrestors, circuit breakers.   (15 Marks)

PART – B

4. Following are the design details of an armature used for small DC motor.

    Diameter of the shaft =5.4cm
    Collar diameter =6.3 cm
    Length of the hub =24.75 cm
    Outer dia. Of armature core =39.6cm
    Inner dia. Armature core= 20.5 cm
    Outer dia. Of end ring =34.2 cm
    Thickness of the end ring = 1.35 cm
    Thickness of the flange = 0.67 cm
    Axial length of the core = 24.75 cm
    Number of armature slot = 48 cm
    Area of parallel slot= 2.4 x 1.04 cm
    Draw to ¼ the full size assembled
    1. Half sectional front elevation
    2. Half sectional end view
    Other missing data should be suitably assumed.   (40 Marks)

5. Draw to scale a) half sectional end view b) front view of alternator with the following data:

    Diameter of shaft = 7.6 cm
    Height of pole = 7.6 cm
    Diameter of frame (outer) = 92 cm
    Length of yoke = 22 cm
    Diameter of the rotor = 46 cm
    Outer diameter of the stator = 76 cm
    Number of poles = 10
    Length of stator = 16 cm   (40 Marks)

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1.   Answer Question 1 <u>or</u> 2 <u>and</u> 3 from PART-A.

2.   Answer Question 4 <u>or</u> 5 from PART-B.

3.   Use of CAD tool that satisfies that requirement of the syllabus is permitted. Suitable
     data may be assumed if not given.

PART - A

1.   Draw wave winding (progressive) for armature of a DC Machine having 34 conductors
     accommodated in 17 slots. Show on the developed winding diagram, the poles, polarity of
     poles, direction of rotation of armature, direction of emf induced/current in the conductors,
     sequence diagram, and position & polarity of brushes.   **(25 Marks)**

OR

2.   Draw the developed winding diagram of an AC motor having the following details.
     No. of poles: 4
     No. of phase: 3
     No. of slots: 12
     Phase spread: 600
     Phase sequence: RYB
     Type of Winding = double layer, full pitch wave winding connected in star.

                                                                          (25 Marks)

3.   Draw the Single line Diagram of a substation having the following equipment.

     a) Incoming lines:110kV, 50 Hz, Two
     b) Outgoing lines:110kV, 50 Hz, One
                        11kV, 50 Hz, Eight
     c) Transformers: 5MVA, 110/11 kV, 3 phase, Δ /Δ, Two
                       15MVA, 110/220 kV, 3 phase, Δ / Δ, One
                       500kVA, 11kV/400 V, 3 phase, Δ / Y, One Auxiliary station transformer
     d) The station is connected to another substation through the 15MVA transformer of
         110/220kV.
     Show the positions of CT, PT, Isolating Switches, Lightning arrestors, circuit breakers.

                                                                          (15 Marks)

PART – B

4. Following are the details of 3 phase, core type transformer. Draw to suitable scale, the following assembled view
   a) Front elevation right half in section
   b) Plan right half in section

   Core: 3 stepped

   Diameter of circumscribing circle = 220 mm
   Distance between adjacent core centers = 350 mm
   Height of the yoke = 250 mm
   Height of the core = 480 mm

   LV winding:

   Inside diameter of LV winding = 231 mm
   Winding in two layer. Total radial thickness = 14.8 mm
   Radial thickness of one layer = 7.4 mm
   Thickness of LV former = 3 mm
   Height of LV winding = 427 mm
   Number of turns per layer = 13

   HV winding: Outside diameter of HV winding = 340 mm

   Total number of coils = 12
   1. Ten coils of 56 turns each (each coil is provided with U pieces each 3mm thick)
   2. Two coils of end gun metal ring each of 14 mm thick
   Height of HV winding = 427 mm
   Average end clearance 33 mm from top and 20 mm from the bottom of the yoke

   (40 Marks)

5. Draw to 1/4th scale the sectional end view (right half in section) of a 50kw dc generator dimensions
   1) Thickness of yoke =5cms
   2) No. of main poles 4
   3) Total height of the pole=14 cms
      (Including pole shoe)
   4) Width of the main pole=12cms
   5) Main pole winding =7cm x 3 cm
   6) No. of inter poles =4
   7) Inter pole section = 10 cm x 4 cm
   8) Air gap= 0.4cm
   9) Pole arc= 63% of pole pitch
   10) External diameter of armature stampings =38cms
   11) Internal diameter of armature stampings =20cms
   12) Size of slots=3.5 cm x 1.5cm
   13) No of slots= 32
   14) Shaft dia=6cms
   15) Inter pole winding = 6cm x 2 cm
   Armature stamping are mounted on the cast iron spider of external diameter 20 cms. Show few slots on the armature. **(40 Marks)**

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PART - A

1. Draw the armature winding of a DC machine with 4 poles, 14 slots, double layer progressive lap show the position of brush & direction of induced emf. Draw the sequence diagram.

(25 Marks)

OR

2. Draw the developed winding diagram for an AC machine with following details:
   a) no poles = 4   b) no. of phase= 3   c) no of slots =24   d) winding = single coil
   short pitched by one slot lap winding star connected .   (25 Marks)

3. Draw the single line diagram using ISI symbols, for a 110kv / 11kv MUSS with the following data:
   a) 110kv incoming lines 2 nos
   b) Line O.C.B's 110 kV 2 nos
   c) Transformer step down 110kv/11kv 2 nos
   d) L.T.O.C.B's for transformer for two nos
   e) Duplicate bus bar on H.T & L.T sides to be indicated
   f) Bus coupler on H.T side only
   g) Feeders 11 kV at L.T side only
   h) L.T circuit breaker for feeders 6 no.s
   i) in appropriate position indicate L.A 's isolators PT's and C.T's
   j) Earthing switch at incoming lines 2 nos
   k) Wave trap at incoming lines 2 no's
   l) Coupling condenser (C.C) at incoming lines 2 nos
   m) Station supply transformer 11kv/415kv to be shown at L.T side.   (15 Marks)

PART – B

4. Draw the following views of a 3 phase, core type, 250KVA, 11KV/400V transformer:
   a) Front elevation full in section
   b) Plan in full section
      Dimensions of various parts are given below:
      Core: cross section of the core= 3 stepped core
              Diameter of circumscribing circle = 24 cm
              Distance between adjacent core centers = 42.5 cm
      Yoke: height of the yoke = 25 cm
      LV winding: Outer diameter of LV coil = 28.3 cm
              Inner diameter of LV coil = 25 cm
              Height of LV winding = 43.5 cm
              Number of turns per phase = 12
      HV winding: Outer diameter of HV coil = 41.5 cm
              Inner diameter of HV coil = 34.3 cm
              Height of HV winding = 43.5 cm
              Number of turns per phase = 572
      Total height of the transformer = 100 cm   (40 Marks)

5. Draw the i) half sectional elevation and ii) half sectional end view of a DC machine, with the following details:
      Shaft diameter = 5 cm
      Axial length of armature = 25 cm
      Number of poles = 4
      Thickness of the yoke = 3.5 cm
      Pole width = 12 cm
      Outside diameter of armature = 36 cm
      Diameter of commutator = 23 cm
      Number of interpoles = 4
      Pole height = 16 cm.
      Indicate all the parts.   (40 Marks)

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