

# 17415

**21819**

**3 Hours / 100 Marks**

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.  
(2) Figures to the right indicate full marks.  
(3) Assume suitable data, if necessary.  
(4) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

- 1. Attempt any TEN of the following:** **20**
- State Fleming's Right Hand Rule.
  - Draw the connection diagram of long shunt differential D.C compound generator.
  - List the various losses on D.C motor
  - Write the voltage equation and power equation of D.C shunt motor.
  - Define armature torque and shaft torque.
  - State any four properties of Ideal transformer.
  - A 50 KVA transformer has iron loss 2 KW on full load. Calculate its iron loss at 75% of full load.
  - Define:
    - Commercial efficiency and
    - All day efficiency, of a transformer
  - Define the transformation ratio in terms of current and voltage.

P.T.O.

- j) Compare core type transformer and shell type transformer on the following parameters.
  - (i) Type of winding used.
  - (ii) Application
- k) State any two conditions for parallel operation of 3- phase transformer.
- l) State any two application of single phase autotransformer

**2. Attempt any FOUR of the following:**

**16**

- a) Derive E.M.F equation of D.C generator.
- b) Describe Ta-Ia characteristics for DC series and DC shunt motor with graph.
- c) What is back e.m.f in DC motor? Explain its significance
- d) A 250 V shunt motor on no- load runs at 1000 rpm and takes 5 A. The total armature and shunt field resistances are  $0.2 \Omega$  and  $250 \Omega$  respectively. Calculate the speed when loaded and taking a current of 50 A, if armature reaction weakens the field by 3%.
- e) Describe the flux control method using field diverter method for speed control of D.C series motor with the help of neat diagram.
- f) The no load current of a transformer is 15 Amp at 0.2 pf. when connected to a 460 V, 50 Hz supply. If the primary winding has 550 turns, calculate:
  - (i) Magnetizing component
  - (ii) Core loss component of no load current
  - (iii) Maximum flux.

**3. Attempt any FOUR of the following:****16**

- a) A 4 pole 1250 RPM DC generator has 72 slots and 12 conductors per slot on armature. The flux per pole is 0.02 wb. Calculate the e.m.f induced when the armature is,
  - (i) Lap wound and
  - (ii) Wave wound.
- b) Explain working of Brushless D.C motor with neat sketch.
- c) Derive the emf equation of a transformer.
- d) A single phase transformer has 300 turns on its primary side and 750 turns on its secondary side. The maximum flux density in the core is  $1 \text{ wb/m}^2$ , calculate
  - (i) The net cross sectional area of core
  - (ii) The emf induced in the secondary side.
- e) With the help of neat diagram, explain the procedure of phasing out test on 3- phase transformer.
- f) Compare distribution transformer and power transformer on the basis of connection, rating cost and maintenance.

**4. Attempt any FOUR of the following:****16**

- a) A 500 KVA transformer has 2500 W iron loss and 7500 W copper loss at full load. Calculate its efficiency at full load at unity pf and 0.8 pf lag.
- b) Draw the equivalent circuit of transformer referred to primary.
- c) "OC test is performed on LV winding and SC test is performed on HV winding of a transformer". Justify.
- d) Explain with the neat diagram, three phase to two phase conversion (Scott connection) of 3 phase transformer.

- e) A 1-phase 50 KVA, 2400/120 V, 50 Hz transformer gave following test results:

OC test (instrument on LV side) : 120 V, 9.85 A, 396 W

Sc test (instrument on HV side) : 92 V, 20.8 A, 810 W

Calculate:

- (i) The equivalent circuit constants.
  - (ii) Efficiency at rated KVA and 0.8 pf lagging
- f) State advantages of amorphous core type distribution transformers.

**5. Attempt any FOUR of the following:**

**16**

- a) Draw a neat experimental set up to conduct OC test on a single phase transformer. Also give any two advantages of OC and SC test.
- b) “Transformer are rated in KVA instead of KW” Justify.
- c) A single phase 100 KVA, 3.3KV/230V, 50 Hz transformer has 89.5% efficiency at 0.85 lagging p.f both at full load and also half load. Calculate the iron loss and full load copper loss.
- d) Explain the criteria of selection of power transformer.
- e) List the special features of welding transformer.
- f) Compare single phase auto transformer with conventional two winding transformer (any four points).

**6. Attempt any FOUR of the following:****16**

- a) 'Performance of a transformer is analyzed on all day efficiency' justify the statement.
  - b) Describe procedure to find polarity of windings of a single phase transformer.
  - c) State the different types of losses occurring in single phase transformer and suggest remedies to minimize those losses.
  - d) Describe working of isolation transformer.
  - e) With the help of neat diagram, explain the construction of current transformer .
  - f) Describe the method of measurement of high voltage in an a.c. circuit using potential transformer.
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