

17969

16117

3 Hours / 100 Marks

Seat No.

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- Instructions :**
- (1) All Questions are *compulsory*.
 - (2) Answer each next main Question on a new page.
 - (3) Illustrate your answers with neat sketches wherever necessary.
 - (4) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any TEN :

2 × 10 = 20

- (a) Draw the circuit for long shunt D.C. generator. State one application of it.
- (b) Suggest the proper material for the following parts of D.C. machines :
 - (i) pole shoe (ii) commutator.
- (c) State principle of operation of D.C. motor.
- (d) State factors affecting back emf.
- (e) Define armature torque. State its unit.
- (f) State any four properties of ideal transformer.
- (g) Draw a phasor diagram of practical transformer on no-load.
- (h) Why transformer rating is in kVA ? Give reason.
- (i) State any four types of cooling used for three phase transformer.
- (j) State the function of following parts of three phase transformer :
 - (i) Breather (ii) Conservator.
- (k) State any two application of isolation transformer.
- (l) State any two advantages of auto-transformer.

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P.T.O.

2. Attempt any FOUR :**4 × 4 = 16**

- (a) Derive an emf equation of d.c. generator.
- (b) Why D.C. series motor should not be started without any load ? Give reason with the help of characteristics.
- (c) An eight pole lap connected armature has 96 slots with six conductors per slot and is driven at 600 rpm. The useful flux per pole is 0.1 wb. Calculate the generated emf.
- (d) A 220 V d.c. shunt motor takes 75 A armature current from the supply and runs at 1000 rpm speed. The armature resistance is 0.1Ω if the torque remains constant the flux reduced to 70% of initial value. Calculate the armature current and speed of motor.
- (e) Define efficiency of d.c. motor and state the condition for maximum efficiency.
- (f) Describe with neat diagram working of brushless d.c. motor.

3. Attempt any FOUR :**4 × 4 = 16**

- (a) Why core of transformer is made up of magnetic material ? What will happen if the core is made up of non-magnetic material ?
- (b) Draw the equivalent circuit of transformer with primary quantities referred to secondary side.
- (c) Compare core type transformer and shell type transformer on the basis of (i) Construction, (ii) Repair, (iii) Cooling, (iv) Application.
- (d) Define (i) Efficiency and (ii) Voltage regulation of transformer.
- (e) List the losses occur in a transformer. How these losses are minimised ?
- (f) Describe armature voltage control method, speed of control method of D.C. series motor.

4. Attempt any FOUR :**4 × 4 = 16**

- (a) State the selection criteria of distribution transformer as per IS : 10028 (part-I) 1985.
- (b) State the features of single phase welding transformer.
- (c) A d.c. shunt motor develops 10 HP at 600 rpm when drawing a line current of 18 A at 500 V. Find efficiency at this load and useful torque in N-m.
- (d) State load sharing of two transformer connected in parallel with equal turns ratio.
- (e) State the procedure to find polarity of windings of three phase transformer.
- (f) State with neat sketch working of single phase autotransformer.

5. Attempt any FOUR :**4 × 4 = 16**

- (a) State the construction of three phase auto-transformer with the help of neat diagram.
- (b) With neat diagram how three phase to two phase conversion (Scott connection) of 3-phase transformer is done ?
- (c) State the advantages of parallel operation of transformer. Also state the conditions for connecting single phase transformer in parallel.
- (d) A single phase 50 Hz transformer has 80 turns on the primary winding and 400 turns on secondary winding. The net cross-sectional area of core is 200 cm^2 . If the primary is connected to 240 V supply. Determine
 - (i) The emf induced in secondary.
 - (ii) The maximum value of flux density in core.
- (e) A 5-kVA, 1000/200 V, 50 Hz single phase transformer gave following test results :
O.C. Test (L.V. Side) 200 V 1.2 A 90 W
S.C. Test (H.V. Side) 50 V 5A 110 W
Compute the parameters of approximate equivalent circuit referred to L.V. side.
- (f) “Core loss can be obtained from O.C. Test results and copper loss can be obtained from S.C. Test results.” Justify this statement.

P.T.O.

6. Attempt any FOUR :**4 × 4 = 16**

- (a) Compare single phase autotransformer with two winding transformer (any four points).
 - (b) What is mean by isolation transformer ? List its features.
 - (c) State the construction and working of current transformer.
 - (d) The number of turns on primary and secondary winding of single phase transformer are 350 and 38 respectively. If primary is connected to 2.2 kV, 50 Hz supply. Determine the primary current when secondary draws 200 A at 0.8 power factor lagging if no-load current is 5A, 0.2 p.f.
 - (e) 5-kVA, single phase transformer has iron loss of 2.5 kW and full load copper loss of 6 kW. The daily variation of load on transformer is as follows :
 - 7 : 00 A.M. to 1 : 00 P.M. : 3 kW at p.f. 0.6
 - 1 : 00 P.M. to 6 : 00 P.M. : 2 kW at p.f. 0.8
 - 6 : 00 P.M. to 1 : 00 A.M. : 6 kW at p.f. 0.9
 - 1 : 00 A.M. to 7 : 00 A.M. : No loadDetermine all day efficiency.
 - (f) Draw figure of following three phase winding connections (i) Dy 1 (ii) Yy 6.
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