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3 Hours / 100 Marks Seat No. | | | | | | | | |

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 of the following: **20**

a) State Fleming's right hand rule.

b) State working principle of DC generator.

c) State atleast four applications of DC series motor.

d) DC series motor should never be started at no load. Justify.

e) Write emf equation of DC short shunt compound motor in the form of their voltage drop.

f) State any two applications of Brushless DC motors.

g) State any four properties of ideal transformer.

h) Define all day efficiency.

i) State why a transformer always have a efficiency of more than 90%.

j) A 3 kVA, 220/110V transformer has 500 turns on its primary. Find its transformation ratio and secondary turns.

P.T.O.

Marks

k) Give the specification of three phase transformer as per IS 1180 (Part-1) 1989 (any four)

l) Give the criteria for selection of distribution transformer as per IS : 10028 (Part - I) 1985.

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

a) Drive the EMF equation of DC generator.

b) A DC generator has an armature emf of 100 V when the usefull flux per pole is 20 mmWb and the speed is 800 rpm. Calculate the generated emf:

(i) With the same flux and speed of 1000 RPM,

(ii) With a flux per pole of 24 mmWb and a speed of 900 RPM.

c) Explain the necessity of starter for DC motor. State various types of DC motor starter.

d) Describe Ta-Ia characteristics for DC series and DC shunt motor.

e) A 250 V shunt motor on no load runs at 1000 RPM and takes 5A. The total armature and shunt field resistance are respectively 0.2Ω and 250Ω. Calculate the speed when loaded and taking a current of 50A, if armature reaction weakens the field by 3%.

f) A 230V DC shunt motor takes 4 A at no load. The armature and field resistance are 0.8Ω and 250Ω respectively. Calculate full load efficiency when the current is 22A.

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

a) Draw the equivalent circuit of transformer refferred to primary. State the meaning of each term related to equivalent circuit.

b) List the advantages of OC and SC test (any four)

c) A 3300/250V, 50 Hz single phase transformer is built on a cone having an effective cross sectional area of 125 cm^2 and 70 turns on the low voltage windings Calculate:
(i) the value of the maximum flux density
(ii) number of turns on the high voltage windings.

d) Explain concept of an ideal transformer with its properties.

e) List the conditions for parallel operation of three, phase transformer.

f) Explain with neat diagram construction and working of a current transformer.

Marks

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

a) Derive the condition for maximum efficiency of transformer.

b) 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 p.f. and 0.8 p.f lagging.

c) Two single phase transformer of 250 kVA each are operated on parallel (both side) their % drops are $(1 + j6)\Omega$ and $(1.2 + j4.8)\Omega$. The load connected across the bus bar is 500 kVA at 0.8 p.f. log. Calculate load shared by each transformer.

d) Draw experimental setup to conduct OC and SC test on a 2.5 kVA, 220 V / 115V, 50 Hz, single phase transformer. Select the ranges of meter used for test.

e) List the various losses in a transformer, the places at which they occur. And list the methods to minimize these losses.

f) Explain construction and operation of 3 phase auto transformer.

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

a) Draw the complete phasor diagram of transformer for lagging p.f load condition and leading pf load condition.

b) State the advantages of amorphous core type distribution transformer.

c) A 500 kVA, distribution transformer having copper and iron losses of 5 kW and 3 kW and 3 kW respectively on full load. The transformer is loaded as shown below.

Loading (kW)	Power factor (log)	No. of hours
400	0.8	06
300	0.75	12
100	0.8	03
No load	-	03

Calculate all day efficiency.

d) Draw a neat diagram of scott connected three phase transformers and explain the working.

e) Compare between distribution transformer and power transformer (any four points)

f) Explain the criteria of selection of power transformer.

Marks

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

a) A single phase 3300/400 V transformer has the following winding resistances and reactances $R_1 = 0.7\Omega$, $R_2 = 0.011\Omega$, $X_1 = 3.6\,\Omega$, $X_2 = 0.045\Omega$. The secondary is connected to a coil having a resistance of 4.5Ω and inductive reactance 3.2Ω. Calculate secondary terminal voltage and the power consumed by the coil.

b) Explain the different types of transformer cooling.

c) Compare two winding transformer with auto transformer on the basis of construction, copper loss, output voltage variation and cost.

d) Explain with circuit diagram use of potential transformer to measure 33 kV.

e) Explain construction and working of isolation transformer.

f) List special features of welding transformer.

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