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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 the function of commutator in DC generator and name the material used for commutator.

b) Draw a neat connection diagram of dc short shunt differential compound generator showing the direction of all the currents.

c) State Fleming's Left Hand Rule.

d) State any four application of DC shunt motor.

e) A DC shunt motor operating on a supply voltage of 200 V dc has armature resistance of 0.5 Ω. If it's armature current is 25A then calculate back emf.

f) State the function of overload coil and No. volt coil in dc motor starter.

g) State any four characteristics of core type transformer.

Marks

h) A 100 KVA transformer has iron loss of 3 KW on full load. Calculate it's iron loss at 50% of full load.

i) State and justify which of the following two transformer is better.

Transformer A = 4% voltage regulation

Transformer B = 6% voltage regulation

j) Define all day efficiency of transformer.

k) Why phasing out and polarity test is carried out on three phase transformer?

l) State different types of cooling system used for three phase transformer.

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

a) Derive the E.M.F. equation of DC generator.

b) A 4 pole, Lap wound DC shunt generator has 1230 armature conductor. Calculate flux developed per pole. If the terminal voltage of generator is 220 V and it is driven at 1500 rpm. The armature is delivering a current of 120 A and has resistance of 0.5 Ω.

c) Explain concept of back emf in DC machine. State how it governs armature current?

d) Explain with suitable diagrams armature diverter method and armature voltage control method for speed control of DC series motor.

e) With the help of neat diagram, explain in brief the working of brushless DC motor.

f) A dc series motor runs at 600 rpm taking 100 A from 230 V supply. Armature and series field winding resistances and are 0.12 Ω and 0.03 Ω. Calculate the speed when current has fallen to 50A. Assume flux to be directly proportional to field current.

Marks

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

a) Give detail classification of transformer.

b) Derive the emf equation of a transformer.

c) A single phase transformer has 400 primary and 800 secondary turns. The net cross - sectional area of the core is 40 cm^2. If the primary winding is connected to 50 Hz supply at 500 V Calculate:

(i) Peak value of the flux density in the core.

(ii) Voltage induced in secondary.

d) Explain why rating of a transformer is in KVA and not in KW?

e) A single phase transformer with ratio of 500/200 V takes a no load current of 3A at 0.4 p.f. lagging. If secondary supplies a current of 50A at a p.f 0.85 lagging, estimate the current taken by primary.

f) OC test is performed on L.V. winding and SC test is performed on H.V. winding of transformer. Justify.

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

a) Performance of a transformer is analyzed on all day efficiency. Justify the statement.

b) A 20 KVA, 1000/400V, single phase 50 Hz transformer has iron and full load copper losses as 300 watt and 500 watt respectively calculate:

(i) Efficiency at full load and 0.8 P.F. lagging.

(ii) Efficiency at half load and unity P.F.

c) A 1000 kVA single phase transformer has full load copper and iron losses as 9 KW and 7 KW respectively. During a day of 24 hours, it is loaded as given below.

Sr. No.	No. of hours	Loading	P.F.
1	6	800 KW	0.8
2	10	600 KW	0.75
3	04	200 KW	0.8
4	04	00 KW	–

Calculate the all day efficiency.

Marks

d) Explain polarity test on single phase transformer.

e) State condition of parallel operation of transformer.

f) For a 3 KVA, 220/110 V, 50 Hz 1ϕ transformer, draw a experimental set up to conduct direct loading test on it. Determine the range of instruments to be used for the direct loading test.

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

a) List various losses in a transformer. State their location. State method to minimize these losses.

b) Two 1ϕ transformer with equal turns have impedances of (0.5 + j3) Ω and (0.6 + J 10) Ω w.r.t. secondary. If they operate in parallel determine. How they will share a load of total 100 KW p.f. of 0.8 lagging?

c) Explain with neat diagram the procedure of conducting phasing out test on 3ϕ transformer.

d) Explain with neat diagram open delta connection of 3ϕ transformer.

e) For Delta - star connection of 3ϕ transformer:

(i) Draw the connection diagram

(ii) List any two advantages of this connection

(iii) State the area of application.

f) State criteria for selection of distribution transformer.

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

a) Explain with neat diagram construction of three phase auto transformer.

b) Compare single phase auto transformer with two winding transformer. (any four points)

c) Draw a neat circuit diagram of connection of CT and PT in power measurement circuit also explain its working.

d) Describe working of welding transformer.

e) What is the most important precaution while operating a C.T.

f) Explain construction and working of isolation transformer.

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