17415

15116

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

Instructions – (1) All Questions are *Compulsory.*

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-programmable Electronic Pocket Calculator is permissible.

(6) 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) Draw connection circuit diagram of:

(i) DC shunt generator

(ii) DC series generator

c) Write voltage equation and power equation of DC motor.

d) Draw power stages block diagram of DC motor.

Marks

e) A four pole d.c. generator having wave wound armature winding has total 1020 conductors. Determine the emf generated when driven at 1500 rpm assuming flux per pole to be 7.0 mWb.

f) A d.c. series motor takes 40 A at 220 V and runs at 800 rpm. If the armature and field resistance are 0.2 Ω and 0.1 Ω respectively, find the torque developed by the armature.

g) Define voltage transformation ratio and turns ratio for 1 - ϕ transformer.

h) State principle of operation of a transformer.

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

j) List characteristics of an ideal transformer.

k) State any two advantages of three phase transformer over bank of single phase transformers.

l) State conditions for parallel operation of 3-phase transformer.

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

a) Study the following figure show in Fig. No. 1

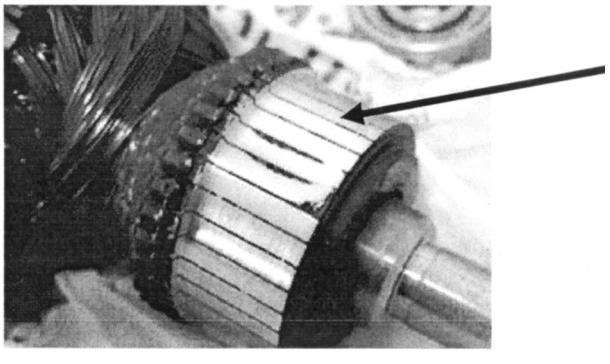

Fig. No. 1

(i) Identify the part of d.c. machine

(ii) Name the material used for it.

(iii) State the use of the above part in case of d.c. motor and generator.

Marks

b) Derive emf equation of d.c. generator.

c) A d.c. series motor operates at 800 rpm with a line current of 100 A from 230 V mains. Its armature circuit resistance is 0.15 Ω and its field resistance is 0.1 Ω. Find the speed at which the motor runs at a line current of 25 A, assuming that the flux at this current is 45% of the flux at 100 A.

d) A d.c. series motor takes 40 A at 220 V and runs at 800 rpm. If the armature and field resistances are 0.2 Ω and 0.1 Ω respectively and the iron and friction losses are 0.5 kW. Find armature torque and efficiency of the motor.

e) Describe the flux control speed control method of d.c. series motor with neat diagram.

f) Describe the reason of using d.c. series motor for electric trains.

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

a) Draw phase diagram for:

(i) Ideal transformer

(ii) Practical transformer on no load and on load.

b) "Performance of a transformer is analysed on all day efficiency" Justify the statement.

c) State the types of cooling used in distribution transformers.

d) Derive an emf equation of a transformer.

Marks

e) From following Figure No. 2 of transformer:

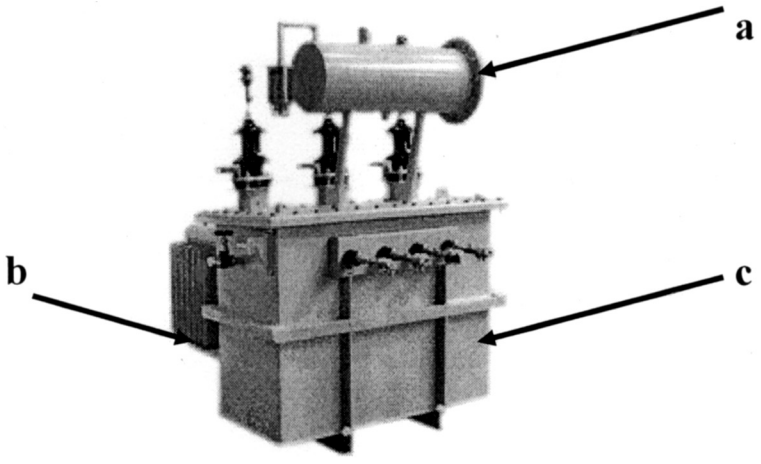

Fig. No. 2

(i) Name the part 'a'.

(ii) State application of part 'b'.

(iii) State material used for part 'c'.

(iv) Name the type of transformer from connections.

f) The max. flux density in the core of a 250/3000V 50Hz 1-phase transformer is 1.2 Wb/m^2. If emf/turn is 8 V, determine area of core and primary and secondary turns.

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

a) A 30 kVA, 2400/120 V, 50 Hz transformer has a high voltage winding resistance of 0.1 Ω and a leakage reactance of 0.22 Ω. The low voltage winding resistance is 0.035 Ω and the leakage reactance is 0.012 Ω. Find the equivalent winding resistance, reactance and impedance referred to LV side.

b) "Transformers are rated in kVA instead of kW". Justify.

c) Derive the equivalent circuit of transformer referred to primary.

Marks

d) A 20 kVA, 2200/220 V, 50 Hz transformer is carried out with O.C. and S.C. test. The results are

O.C. test: 220 V, 4.2 A, 148 W

S.C. test: 86 V, 10.5 A, 360 W

Determine regulation at 0.8 p.f. lagging and at full load. Also calculate p.f. at S.C.

e) Describe the working of transformer on load with the help of phasor diagram considering lagging (inductive) load.

f) State advantages of parallel operation of transformer.

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

a) Describe polarity test on transformer with neat diagram.

b) A 100-kVA lighting transformer has a full load loss of 3 kW, the losses being equally divided between iron and copper loss. During a day, the transformer operates on full load for 3 hrs, one half load for 4 hrs, the output being negligible for the remainder of the day. Calculate all day efficiency.

c) Two single transformers of 250 kVA each are operated on parallel. Their percentage 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. lag. Calculate the load shared by each transformer.

d) List any four parts of 3 phase transformer and state function of each part.

e) State the criteria for selection of distribution transformer as per IS 10028 (part 1) : 1985

f) Distinguish between distribution transformer and power transformer on the basis of connection, rating, cost and maintenance.

Marks

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

a) Why phasing out test and polarity test are carried out on 3-phase transformer?

b) Draw a neat circuit diagram of connection of C.T. and P.T. in the power circuit.

c) Describe the features of isolation transformer.

d) List the advantages of instrument transformers.

e) Describe working of welding transformer.

f) Compare 1-phase auto transformer and two winding transformer on basis of construction, copper loss, cost and weight.

———