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[5459]-156

S.E. (Electrical) (Second Semester) EXAMINATION, 2018

ELECTRICAL MACHINES—I

(2015 PATTERN)

Time : Two Hours

Maximum Marks : 50

N.B. :— (i) Answer Q. Nos. 1 or 2, Q. Nos. 3 or 4, Q. Nos. 5 or 6, Q. Nos. 7 or 8.

(ii) Neat diagrams must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Use of logarithmic tables, electronic pocket calculator is allowed.

(v) Assume suitable data, if necessary.

1. (a) Open circuit test and short circuit test is carried out on a single phase, 230/500 volt, 25 kVA transformer. The observations are as below : [7]

Open circuit test :

(With HV winding open) 230 Volt, 5 Amp, 200 Watt

Short circuit test :

(With HV winding shorted) 6 Volt, 100 Amp, 180 Watt

Find the parameters of equivalent circuit referred to LV side.

- (b) With suitable phasor diagram explain wye/delta connection and delta/wye connection for 3-phase transformer. Clearly mark the angular displacement in respective phasor diagram. [6]

P.T.O.

Or

2. (a) A distribution transformer of 500 kVA has full load copper loss of 4.5 kW and iron loss is 3.5 kW. The loading of transformer for entire day is as follows : [7]

No. of Hours	Loading of kW	Power Factor
6	400	0.8
10	300	0.75
4	100	0.8
4	0	—

Determine all day efficiency of the distribution transformer.

- (b) State and explain the conditions to be satisfied for satisfactory parallel operation of two transformers. [6]
3. (a) Draw a neat diagram showing constructional details of a DC machine. Name all the parts. State the material used and function of respective part. [6]
- (b) State the *two* methods of speed control of DC motor. Give comparison of these two methods (minimum 5 points of comparison expected). [6]

Or

4. (a) A DC shunt motor takes a current of 4 Amp at no-load and runs at 720 rpm. The armature resistance is 0.2 ohm and shunt field resistance is 110 ohm. Calculate its speed at full load condition if full load current is 50 Amp. Assume that flux is reduced by 3% on full load condition due to armature reaction. [6]
- (b) With suitable diagrams explain armature reaction in case of DC machine. [6]

5. (a) A 3-phase induction motor has synchronous speed of 250 rpm and slip of 4% at full load. The rotor has resistance of 0.02 ohm per phase and standstill reactance of 0.15 ohm per phase. Calculate : [7]
- (i) Ratio of maximum torque to full load torque.
 - (ii) The speed at which maximum torque is developed.
- (b) With a neat diagram explain constructional details of slip-ring type 3-phase induction motor. State its *two* advantages. [6]

Or

6. (a) The input to a 3-phase, 6 pole, 50 Hz induction motor is 47 kW at certain load. The total stator losses are 1 kW and mechanical losses are 1 kW. The motor runs at 970 rpm. Determine the HP output of motor. [7]
- (b) With suitable phasor diagrams, explain how rotating magnetic field is produced when a 3-phase winding is fed by symmetrical 3-phase supply. [6]
7. (a) Explain why 3-phase induction motor needs a starter ? Draw a neat sketch of autotransformer starter and explain its working. [6]
- (b) Develop the approximate equivalent circuit for 3-phase induction motor in steps. Clearly mark all the parameters in the equivalent circuit. Briefly explain each step. [6]

Or

8. (a) With suitable circuit diagram explain no-load test carried out on 3-phase induction motor. What information is obtained from this test ? What assumptions are made while finding losses from this test ? [6]
- (b) Compare three-phase induction motor with 3-phase transformer on any *six* points. [6]