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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Four Year B.Tech III Semester End Examinations (Regular) - November, 2018

Regulation: IARE – R16

DC MACHINES AND TRANSFORMERS

Time: 3 Hours

(EEE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

1. (a) With the help of neat diagram obtain the expression for the energy stored in a magnetic system for a simple attracted armature type relay. [7M]
- (b) The magnetic flux density on the surface of an iron face is 1.6 T which is a typical saturation level value for ferromagnetic material. Find the force density on the iron face. [7M]
2. (a) Explain the ‘field energy’ and ‘co-energy’ in magnetic system. [7M]
- (b) Discuss in detail the production of mechanical force for an attracted armature relay excited by an electric source. [7M]

UNIT – II

3. (a) Making use of Faraday’s law derive the equation for the emf induced in a DC Machine. [7M]
- (b) The armature of 6 pole DC generator has a wave winding containing 664 conductors. Compute the generator emf when flux per pole is 0.06 Weber and the speed is 250 rpm. At what speed must be the armature an emf of 250 V if the flux per pole is reduced to 0.058 Weber. [7M]
4. (a) Derive the emf equation of self excited and separately excited DC generators. [7M]
- (b) A 8 Pole DC shunt generator with 778 wave connected armature conductors and running at 500 rpm supplies a load of 12.5Ω resistances at terminal voltage of 50 V. The armature resistance is 0.24Ω and field resistance is 250Ω . Find the armature current, induced emf and the flux per pole. [7M]

UNIT – III

5. (a) Explain the working of 4 point starter for a dc shunt motor. Draw the diagram of connections showing OLC and NVC and mention advantages and disadvantages compare to 3- point starter. [7M]
- (b) A DC shunt motor runs at speed of 1000 rpm on no load taking a current of 6A from the supply when connected to 220V DC supply .Its full load current is 50A. Calculate its speed on full load .Assume $R_a=0.3 \Omega$ and $R_{sh} = 110 \Omega$. [7M]

6. (a) Explain the internal and external characteristics of DC shunt motor. [7M]
 (b) A 500 V DC shunt motor running at 700 rpm takes an armature current of 50 A. Its effective armature resistance is 0.4Ω . What resistance must be placed in series with armature to reduce the speed to 600 rpm, the torque remaining constant? [7M]

UNIT – IV

7. (a) Derive an expression for the emf of an Ideal transformer. [7M]
 (b) A 20 KVA, 2500/250 V, 50 Hz, 1-phase transformer has the following test results.
 O.C. test (l.v. side): 250 V, 1.4 A, 105 W
 S.C. test(h.v. side): 104 V, 8A, 320 W
 Compute the efficiency at full-load and 0.8 lagging power factor. [7M]
8. (a) How do you find equivalent parameters of a given transformer, explain in detail? [7M]
 (b) Two transformers A and B are joined in parallel to the same load. Determine the current delivered by each transformer, given open circuit emf 6600 V for A and 6400 V for B. equivalent leakage impedance in terms of the secondary $(0.3+j3)\Omega$ for A and $(0.2+j1)\Omega$ for B. the load impedance is $(8+j6)\Omega$. [7M]

UNIT – V

9. (a) With the help of circuit diagrams, explain any two types of three phase transformer connections. [7M]
 (b) A 500 KVA, 3-phase, 50 Hz transformer has a voltage ratio (line voltage) of 33/11 KV and is delta/star connected. The resistance per phase is: high voltage side 35Ω , low voltage side 0.876Ω and the iron loss is 3050 W. Compute the value of efficiency at full load and one-half of full-load respectively at 0.8 power factor lagging. [7M]
10. (a) Explain in detail about the operation of Auto transformers and derive the expression for copper savings. [7M]
 (b) Explain in detail about the Scott connection in Three phase transformer. [7M]

