310607

B. Tech. III Sem. (Main) Exam., Dec. - 2019
Common for EE/EEE
3EE4-07 Electrical Machine - I

Time: 3 Hours   **Maximum Marks: 120**

Instructions to Candidates:

Part – A: Short answer questions (up to 25 words) 10 ×2 marks = 20 marks. All ten questions are compulsory.

Part – B: Analytical/Problem Solving questions 5 ×8 marks = 40 marks. Candidates have to answer five questions out of seven.

Part – C: Descriptive/Analytical/Problem Solving questions 4 ×15 marks = 60 marks. Candidates have to answer four questions out of five.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

1. NIL _____   2. NIL _____

PART - A

Q.1 Explain the principle of transformers?   [2]

Q.2 What are equipotential surfaces?   [2]

Q.3 State Biot-Savart's law?   [2]

Q.4 Define the following terms as used for instrument transformers-   [2]

    (a) Transformation Ratio

    (b) Nominal Ratio

Q.5 Explain B-H curve for magnetic materials. [2]

Q.6 Define the following terms with respect to magnetic circuits- [2]

(a) Reluctance

(b) Inductance

Q.7 Write a short note on switching currents in transformers? [2]

Q.8 What is working principle of DC motor? [2]

Q.9 What is harmonics in transformer? [2]

Q.10 Define the following terms- [2]

(a) Turns Ratio

(b) Ratio correction factor

PART - B

Q.1 Obtain EMF equation for a DC machine? [8]

Q.2 With the help of a suitable diagram explain hysteresis and eddy currents losses as applied to magnetic material. [8]

Q.3 Sketch the speed- torque characteristics method of speed control of a DC series motor. [8]

Q.4 Explain the back to back method of testing for two identical single phase transformers. [8]

[1750]

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Q.5 A single phase 120 kVA, 2200/220V transformer is connected as an auto transformer which is shown in figure. At the secondary, more than 2200V is obtained as an output, the upper portion coil voltage is 220V and lower portion coil voltage is 2200V. Find out the kVA rating of the auto transformer. [8]
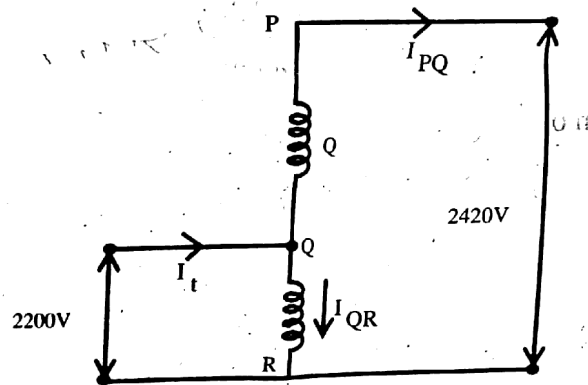
Q.6 Explain the effect of armature reaction in a DC generator. How are it's demagnetizing and cross magnetizing ampere turns calculated? [8]

Q.7 A 3-phase step down transformer is connected to 6.6 kV mains and takes 100A. Calculate the secondary line voltage and line current for the connections- [8]

(a) $\dfrac{\Delta}{\Delta}$

(b) $\dfrac{y}{y}$

(c) $\dfrac{\Delta}{y}$

(d) $\dfrac{y}{\Delta}$

The ratio of turns per phase is 12 and neglect no load losses.

PART – C

Q.1 Define an auto-transformer? Derive the expression showing the saving of copper when a two winding transformer is converted into an auto-transformer? [15]

Q.2 Discuss the energy stored in magnetic field with respect to torque with suitable example.

[15]

Q.3 Explain the operation of a magnetic circuit when AC current is applied to the coil wound on iron-core. Draw the B-H curve and obtain the expression for hysteresis and determine the permeability of a magnetic material and the factor on which it depends. [15]

Q.4 A 10 kW, 240V, DC shunt motor draw a line current 5.2A while running at no-load speed of 1200 rpm from a 240V DC supply. It has an armature resistance of 0.25 ohm and a field resistance of 160 ohm. Estimate the efficiency of the motor when it delivers rated load. [15]

Q.5 Write notes on any two of the following: [15]

(a) Scott- connection w.r.t. 3 phase transformer.

(b) Excitation phenomenon of transformers.

(c) Magnetizing inrush current in transformers.