Code No: 133AM

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2017
ELECTRICAL MACHINES – I
(Electrical and Electronics Engineering)

Time: 3 Hours   Max. Marks: 75

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) How does field distortion affect commutation?   [2]
 b) Mention the causes for failure of dc shunt generator to excite.   [3]
 c) What do you mean by stalling current in DC Motor?   [2]
 d) What are the functions of no-voltage release coil and over load release coil in dc
    motor starter?   [3]
 e) Mention the factors on which hysteresis loss depends.   [2]
 f) What are the advantages and disadvantages of Swinburne's Test?   [3]
 g) Why transformer rating is expressed in terms of kVA?   [2]
 h) What is the difference between cylindrical-type and sandwich-type winding?[3]
 i) What are the advantages of Sumpner's test over OC and SC tests?   [2]
 j) What are the necessary conditions required for parallel operation of single phase
    transformer?   [3]

PART-B

(50 Marks)

2.a) Discuss in detail, the load characteristics of DC Series and Shunt generators.
 b) A 440 V, 4-pole, 25 kW, dc generator has a wave-connected armature winding
    with 846 conductors. The mean flux density in the air-gap under the interpoles is
    0.5 Wb/m^2 on full load and the radial gap length is 0.3 cm. Calculate the number
    of turns required on each interpole.   [5+5]

OR

3.a) Explain about demagnetizing AT/pole and cross magnetizing AT/pole.
 b) Briefly explain the function of compensating winding in DC machine.   [5+5]

4.a) Derive the torque equation of a DC Motor.
 b) A 250V shunt motor runs at 1000 rpm at no load and takes 8A. The total armature
    and shunt field resistances are 0.2 and 250 ohms respectively. Calculate the speed
    when loaded and taking 50A. Assume the flux to be constant.   [5+5]

OR

5.a) Derive the condition for maximum efficiency in DC machines.
 b) The iron losses in a dc machine, when driven at normal speed and at normal
    excitation are 8KW. When driven at half speed and same excitation the losses are
    reduced to 3 KW. Determine the values of eddy current and hysteresis losses at
    (i) half speed and (ii) full speed.   [5+5]

6.a) Describe the brake test on DC motor to determine the performance characteristics of DC motor.

  b) A 440V DC Shunt motor takes 4A at no load. Its armature and field resistances are 0.4Ω and 220Ω respectively. Estimate the kW output and efficiency when the motor takes 60A on full load. [5+5]

OR

7. With a neat sketch, explain the procedure of Hopkinson's Test? Mention its advantages and disadvantages. [10]

8.a) From the fundamentals, develop the exact equivalent circuit of a Transformer.

  b) A single phase 50Hz transformer has 100 turns on the primary and 400 turns on the secondary winding. The net cross sectional area of core is $250cm^2$. If the primary winding is connected to a 230V 50Hz supply, determine:
  i) The EMF induced in the secondary winding
  ii) The maximum value of flux density in the core. [5+5]

OR

9.a) Define efficiency and regulation of a transformer. Show how the power factor affects both of them.

  b) The voltage per turn of a single phase transformer is 1.1V. When the primary winding is connected to a 220V, 50Hz A.C supply, the secondary voltage is found to be 550V. Find:
  i) Primary and Secondary turns
  ii) Core area if the maximum flux density is 1.1 wb/m^2. [5+5]

10. Mention the different tests that are conducted on Transformer? Explain the procedure for conducting Sumpner's test along with all precautions to be taken while conducting the test with neat diagram. [10]

OR

11.a) Explain the effect of third harmonics in phase voltages of three phase transformers.

  b) A 3phase transformer bank consisting of three 1-phase transformers is used to step-down the voltage of a 3-phase, 6600V transmission line. If primary line-current is 10Amp, calculate the secondary line voltage, line current and output KVA for the following connections. i. Y/ Δ and ii. Δ/Y. The turn's ratio is 12. Neglect losses. [5+5]

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