Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(EE/Electrical & Electronics/Electronics & Electrical) (2011 Onwards)
(Electrical Engineering & Industrial Control) (2012 Onwards)
(Sem.–3)
TRANSFORMERS AND DIRECT CURRENT MACHINES
Subject Code : BTEE-302
M.Code : 57093

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTION TO CANDIDATES :
1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

1. Answer briefly :

   a) How can we reduce eddy current and hysteresis loss in electrical machines?

   b) Derive e.m.f. equation of a transformer.

   c) How auto-transformer is different from two winding transformer?

   d) Draw the phasor diagram of a practical transformer at no load.

   e) What are the necessary conditions for three phase transformers operating in parallel?

   f) Derive the torque equation of DC motor.

   g) What is meant by self-excited and separately excited DC generator?

   h) In DC machines, why the series field winding has low resistance and shunt field winding has high resistance?

   i) Why the star connected high voltage side power transformer is 10% cheaper than delta connected high voltage side transformer?

   j) Which losses can be identified from Swinburne's test?

SECTION-B

2. A 220 V DC series motor is running at a speed of 800 rpm and draw 100A. Calculate at what speed motor will run when developing the half of torque. Total resistance of armature and field is 0.1Ω .Assume that magnetic circuit is unsaturated.

3. What are the necessary conditions for voltage build- up of DC shunt generator? Draw the characteristic curves for magnetization, internal and external characteristics for DC series and shunt generators.

4. With the help of neat sketches, discuss armature reaction in DC machines.

5. Why the Hopkinson's test is performed on two similar DC shunt motors? Support your answer with the help of circuit diagram.

6. A 120 V DC shunt motor having an armature circuit resistance of $0.1\ \Omega$ and field circuit resistance of 60Ω, draws a line current of 40 A at full load. The brush voltage drop is 2V and rated full load speed is 2000 rpm. Calculate :

    a) speed at half load

    b) at 150% of full load

SECTION-C

7. a) Draw the well-labeled Scott connection of transformers. Explain, how two three-phase transformers can be used to convert a three-phase supply to a two-phase one? If the load is balanced on one side, show that it will be balanced on the other side.

    b) A 250kVA, 2.2kV/440V, 50Hz, 2-winding transformer is to be used as an auto-transformer to step-up the voltage of 2200V to 2640V. The transformer has an efficiency of 97% at 0.8 power factor lagging, impedance of 4% and regulation of 3%. Determine : (i) voltage and current ratings of each side, (ii) kVA rating, (iii) efficiency at 0.95 power factor lagging, (iv) regulation, and (v) kVA transformed and kVA conducted at full load while it is used as an auto-transformer.

8. A three phase transformer is used to step down the voltage revel of a three phase, 11 kV line. Per phase turns ratio is 12. For a primary line current of 20A, compute the secondary line voltage, line current and output kVA for (i) star-delta (ii) delta- star. Also draw phasor diagrams also.

9. With the help of neat sketches, discuss :

    a) Three winding transformer's equivalent circuit

    b) Open circuit and short circuit test on single phase transformer

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.