

**R16**

Code No: 133AM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, April/May - 2018

**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) Distinguish between progressive and retrogressive winding. [2]
- b) An 8 pole wave connected armature has 300 conductors and runs at 800 rpm. Determine the useful flux / pole if the electromotive force generated on open circuit is 500V. [3]
- c) Distinguish between armature resistance control and field resistance control while controlling the speed of dc shunt motors? [2]
- d) Why is the starting current in dc motors very high? Describe the need of starter? [3]
- e) Define efficiency of dc machine and give its losses? [2]
- f) Why is Hopkinson's test called regenerative test? [3]
- g) The parameters of 2400/120V, 50Hz transformer are  $R_1=0.1$  ohms and  $R_2=0.035$  ohms. Find  $R_{01}$  and  $R_{02}$ ? [2]
- h) Will the transformer draw any current from the source when secondary is open? Draw the phasor diagram for actual transformer on no-load? [3]
- i) Define energy efficiency and voltage regulation of transformer? [2]
- j) Distinguish between autotransformer and ordinary 2-winding transformer in brief? [3]

**PART-B**

**(50 Marks)**

- 2.a) What do you understand from the term armature reaction? Describe the role of compensating windings in a dc generators?
  - b) In a DC compound generator the armature, shunt-field winding and series field winding resistances are given by 0.6 ohm, 150 ohms and 0.3 ohms respectively. The machine is connected to a load of 15 kW, 200 V. Find the i) EMF generated ii) armature current and iii) power generated by armature when the machine is connected in Long shunt mode. [5+5]
- OR**
- 3.a) Distinguish between GNA and MNA. Describe the role of interpoles in a DC generator.
  - b) Draw the load characteristics of d.c compound motor and shunt motor. [5+5]

- 4 a) Explain principle of operation of DC motor with a neat sketch.  
b) A DC series motor is running with a speed of 1000 RPM while taking a current of 30 A from the supply. If the load is changed such that the current drawn by the motor is increased to 70 A, calculate the speed of the motor on new load. The armature and series field winding resistances are 0.25 ohms and 0.35 ohms respectively. Assume the flux produced is proportional to the current. Take supply voltage as 260 V. [5+5]

OR

- 5.a) Why is dc series motor should never start on no-load? Draw and explain the various characteristics of DC series motor.  
b) List out the advantages of 4-point starter over 3-point starter? Draw and explain the 4-point starter along with protective devices. [5+5]

- 6.a) Describe how you find the efficiency of dc motor using Brake test. What are its disadvantages?  
b) Explain how the efficiency of two dc machines can be determined using Hopkinson's test? Draw the appropriate diagrams where ever necessary? [5+5]

OR

- 7.a) Explain Field's test performed on dc machines.  
b) What are the advantages of Swinburne's test over direct loading? Explain the test with relevant expressions. [5+5]

- 8.a) "Core losses remains constant in the core irrespective of status of load across the secondary", Justify your answer in brief. Draw necessary diagram.  
b) A single phase transformer with a ratio of 440/110V takes a no-load current of 5A at 0.2 p.f lagging. If the secondary draws a current of 120A on load at 0.8 p.f lagging, calculate the primary current  $I_1$  in primary? Draw the phasor diagram. [5+5]

OR

- 9.a) Describe the effect of frequency and supply voltage on core losses.  
b) Obtain the equivalent circuit parameters of 200/400V, 50 Hz, 1-phase transformer from the following test data.  
OC test: 200V, 0.7A, 70W.  
SC test: 15V, 10A, 85W (with LV Short circuit). [5+5]

10. The OC and SC test data of 4 kVA, 200/400V, single phase transformer when supplying full load at 0.8 lagging p.f is given below.  
OC test: 200V, 0.8A, 70W (HV open circuit)  
SC test: 20V, 10A, 60W (LV short circuit)  
Calculate efficiency at a) full load, b)  $\frac{1}{2}$  Full load and c) Voltage regulation at Full load. [10]

OR

- 11.a) Explain the working of single phase auto transformer with neat diagrams? Derive an expression for saving of copper in it when compared to ordinary two winding transformer?  
b) What is the significance of Y-Y, Y-delta and Delta-Y, Delta-Delta connections in 3-phase transformers? [5+5]