

**R18**

Code No: 153AQ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, April/May - 2023

ELECTRICAL MACHINES - I

(Electrical and Electronics Engineering)

Time: 3 Hours

Max. Marks: 75

- Note:** i) Question paper consists of Part A, Part B.  
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.  
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A****(25 Marks)**

- 1.a) Name the different parts of a DC Machine. [2]
- b) What is the difference between Lap winding and Wave winding? [3]
- c) What are the losses occur in DC Machines? [2]
- d) What are the applications of d.c. motor? [3]
- e) What is Field's test? [2]
- f) What is the difference between direct and indirect testing of DC Machines? [3]
- g) What is the transformer ratio? [2]
- h) Why the transformer rating is in KVA? [3]
- i) What is the tertiary winding? [2]
- j) What are the advantages of three phase transformers? [3]

**PART - B****(50 Marks)**

- 2.a) What do you understand by demagnetizing and cross magnetizing affects of armature reaction in DC machine?
- b) A separately excited d.c. generator with constant excitation is connected to a constant resistance circuit. When the speed is 1200 rpm, it delivers 120A at 500V. At what speed will be the current be reduced to 60A? Armature resistance = 0.1 ohm. Contact drop per brush = 1V. Armature reaction may be ignored. [5+5]

**OR**

3. With the help of neat sketch, Explain how the open circuit characteristics can be obtained and how the critical speed and critical field resistance are determined. [10]
- 4.a) Describe the principle of operation of DC motor.
- b) A 120V DC shunt motor has an armature resistance of  $0.2\Omega$  and a field resistance of  $60\Omega$ . The full load line current and full load speed are 60A and 1800 rpm. If the brush contact drop is 3V. Find the speed of the motor at half load. [5+5]

**OR**

5. What is the necessity of a starter for DC Motor? Explain in detail about 3– point starter. [10]

- 6.a) Explain in detail, how the brake test is conducted on DC Shunt motor?  
b) What are the merits and demerits of Hopkinson's test? [5+5]

**OR**

7. With suitable diagram, how the Swinburne's test can be employed to predetermine the efficiency at full load condition when running as a (a) generator and (b) motor. [10]

- 8.a) Explain in detail how eddy current and hysteresis losses of a transformer can be minimized.  
b) At 400 V and 50 Hz the core loss of a transformer was found to be 2400 W. When the transformer is supplied at 200 V and 25 Hz, the core loss is 800 W. Calculate the hysteresis and eddy current loss at 400 V and 50 Hz. [5+5]

**OR**

9. From the fundamentals, obtain the equivalent circuit of a single phase transformer. [10]

- 10.a) Derive an expression for the saving of copper in an autotransformer as compared to an equivalent two winding transformer.  
b) A three phase step down transformer is connected to 6.6 kV supply mains and takes 80A. Calculate its secondary line voltage and line current for the following connections if the ratio of turns per phase is 16. (i) Y-Y (ii) Y- $\Delta$  (iii)  $\Delta$ - $\Delta$ . [5+5]

**OR**

- 11.a) Define voltage regulation of a transformer and derive condition for zero and maximum regulation.  
b) A Scott-connected transformer supplies two single phase furnaces at 100V, each taking 200kW. The load on the leading phase is at unity power factor and that on the other phase is 0.8 lagging power factors. The 3-phase input line voltage is 11000V. Calculate the line currents on the primary side. Neglect the magnetizing current and leakage impedance. [5+5]

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