

Code No: 133AM

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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) Under what circumstances a DC shunt generator does fails to generate? [2]
- b) Define Commutation and Commutation period. [3]
- c) A d.c shunt motor is connected to a 3-point starter. Explain what would happen if the field circuit becomes open circuit with the motor running at no-load. [2]
- d) Obtain the condition for maximum efficiency of the DC motor. [3]
- e) Name any 2 non-loading method of testing DC machines. [2]
- f) Write the advantages and disadvantages of direct loading test on DC machine. [3]
- g) Derive the condition for zero regulation in transformers. [2]
- h) Draw the phasor diagram of a transformer on a lagging load. [3]
- i) What are the conditions for satisfactory parallel operation of 1- ϕ transformer? [2]
- j) What do you mean by open delta connection? When it is used? [3]

PART – B

(50 Marks)

2. Explain the effect of armature reaction in a DC shunt generator. How are its demagnetizing and cross-magnetizing ampere turns calculated? [10]

OR

- 3.a) Draw the sketches for different methods of excitation of DC generators and write the respective generated emf equations.
- b) A d.c. machine has 8 poles, lap connected armature with 960 conductors and flux per pole is 40 mWb. It is driven at 400 r.p.m. Calculate the generated e.m.f. If now lap connected armature is replaced by wave connected, calculate the speed at which it should be driven to generate 400V. [5+5]
4. What is the necessity of starter in a DC motor? Explain the working principle of 3-point starter with a neat sketch. Also explain about protective measures in the starter. [10]

OR

- 5.a) Draw the various characteristics of shunt, series and compound motors.
 b) A 220V d.c shunt motor has an armature resistance of 0.5Ω . If full load armature current is 25 A and the no-load armature current is 3A. Find the change in back emf from no-load to full-load. [5+5]
- 6.a) With the help of neat circuit diagram, explain Swinburne's test and derive the relations for efficiency (both for generator and motor) also state the merits and demerits of this method.
 b) In a Field's test on two 230V, 1492kW mechanically-coupled series motors, the following figures were obtained. Each has armature and compole winding resistance of 2.4Ω , series field resistance of 1.45Ω and total brush drop of 2V. The p.d across armature and field was 230V with a motor current of 10.1A. The generator supplied a current of 8.9A at a terminal p.d. of 161V. Calculate the efficiency and output of the motor for this load. [5+5]
- OR**
- 7.a) How do you perform the Field's test of DC series motor experimentally and calculate various losses and efficiency.
 b) A 500V, shunt motor takes a total current of 5A when running unloaded. The resistance of armature circuit is 0.25Ω and the field resistance is 125Ω . Calculate the efficiency and output when the motor is loaded and taking a current of 100A. [5+5]
- 8.a) Explain the operation of transformer on no load with a neat vector diagram.
 b) Define all day efficiency. How this efficiency of a transformer varies with load? [5+5]
- OR**
- 9.a) Explain the effect of variation of frequency and supply voltage on losses of transformer.
 b) Derive the emf equation of a single-phase transformer. [5+5]
10. The test results of 2.5KVA, 230/115 V Single phase transformer is as follows:
 OC test: 115V, 1.2A, 60W
 SC test: 12V, 10.86 A, 120W
 Find a) efficiency at 50% full load 0.8 pf
 b) Regulation at 30% full load, 0.8 pf lead and lag. [10]
- OR**
- 11.a) Illustrate Sumpner's method of testing transformer. What are its advantages over OC and SC tests?
 b) Define the principle and explain the equivalent circuit of auto transformer. [5+5]

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