



ADAMAS UNIVERSITY
END-SEMESTER EXAMINATION : JANUARY 2021
(Academic Session: 2020 – 21)

Name of the Program:	B. Tech.	Semester:	III
Paper Title :	Electrical Machines – I	Paper Code:	EEE42105
Maximum Marks :	40	Time duration:	3 hours
Total No of questions:	8	Total No of Pages:	2
(Any other information for the student may be mentioned here)	1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam. 2. Assumptions made if any, should be stated clearly at the beginning of your answer.		

Answer all the Groups

Group A

Answer all the questions of the following

$5 \times 1 = 5$

1.
 - a) Under what condition regulation of a transformer can be zero? Discuss.
 - b) What is the difference between a coil and a winding?
 - c) Discuss core loss in a transformer. What are the components of this core loss?
 - d) Discuss briefly the polarity test in a single phase transformer.
 - e) Discuss the advantages/disadvantages of a single unit three phase transformer and a three phase transformer bank.

GROUP –B

Answer *any three* of the following

$3 \times 5 = 15$

2.
 - (a) State Faraday's first law and second law.
 - (b) State Lenz's law.
 - (c) Interpret and explain Lenz's law with the support of an experiment. (1 + 1 + 3 = 5)
3.
 - (a) Draw the equivalent circuit of a single phase transformer on no-load. Draw the related phasor diagram with proper labelling.
 - (b) A 230/110 V single phase transformer takes an input of 350 VA at no-load and rated voltage. The core loss is 110 W. Find (i) the iron loss component of no-load current, (ii) the magnetising component of no- load current and (iii) the power factor at no-load. (2 + 3 = 5)
4.
 - (a) Derive the expression for efficiency of a single phase transformer having a load fraction x and power factor $\cos \theta$. Consider the rated VA of the transformer to be S , rated iron loss P_i and rated copper loss P_c .
 - (b) Derive the condition for maximum efficiency of a single phase transformer at any load fraction x . (3 + 2 = 5)

5. Draw the circuit diagram of a Y- Δ connected three phase transformer and show that the power on both the primary side and the secondary side are equal and is expressed by $\sqrt{3}VI$, where V and I are the line voltage and line current respectively. (5)

GROUP –C

Answer *any two* of the following

$2 \times 10 = 20$

6. (a) What are the conditions for parallel operation of two single phase transformers? Discuss why these conditions are very much necessary.
(b) Two single phase transformers A and B are operating in parallel and carry current **I_A** and **I_B** respectively while feeding a common load. Derive expressions for the currents **I_A** , **I_B** and the circulating current **I_c** considering slight imbalance. Also, find expressions for the VA loads shared by transformers if their equivalent impedances are **Z_1** and **Z_2** respectively. (All the symbols in bold face are phasors). (3 + 7 = 10)
7. (a) What is open delta or V-V connection of a three phase transformer? Discuss with winding diagram.
(b) What are the advantages or disadvantages of such a connection?
(c) Show using relevant circuit diagram that if a Δ - Δ transformer is used for V-V operation, keeping the load unchanged, the overload on each of the the remaining two transformers is 73 per cent. (3 + 4 + 3 = 10)
8. (a) Describe, with diagram, the operating principle of a DC generator.
(b) Describe, with diagram, the operating principle of a DC motor.
(c) Discuss the speed control of a DC shunt motor by controlling the field flux. (3 + 3 + 4 = 10)
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