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2112E141

BACHELOR OF VOCATION
Mechatronics
Subject: Electrical Machines & Control systems
Subject Code: EE-603
Semester: Third
December 2021
Theory (External): 35 Marks
Time: 03 hours

Instructions to the Students

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of objective type in nature. All questions are compulsory. Each question carries 1 mark.
3. Section B comprises 8 essay type questions out of which students need to do any 5. Each question carries 5 marks.
4. Read the questions carefully and write the answers in the answer sheets provided.
5. Do not write anything on the question paper.
6. Wherever necessary, the diagram drawn should be neat and properly labelled

| Roll Number | | | | | | | | | |
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SECTION -A (OBJECTIVE TYPE QUESTIONS)
(10x1=10 Marks)

- A. Why are interpoles used in D.C. Machines?
- B. How is armature reaction effect in D.C. machine neutralized to have sparkles commutation?
- C. Express percentage slip in terms of synchronous speed in three phase induction motor.
- D. Give the expression showing relation between synchronous speed, stator supply frequency and stator no. of poles.
- E. Express the e.m.f equation of synchronous generator?
- F. Express and define regulation of a synchronous generator.
- G. State whether the statement is true or false and also give the reason in support of your answer: "Armature reaction at zero leading power factor loads causes an increase in the resultant air-gap flux".
- H. Why negative feedback is invariably preferred in closed loop system.
- I. Name any two dynamic models used to represent control systems.
- J. Write Mason Gain formula.

SECTION -B (ESSAY TYPE QUESTIONS)
(5x5=25 Marks)

1. Explain synchronous impedance method of determining regulation of an alternator.
2. Explain distribution factor and pitch factor used in emf equation of a synchronous machine.
3. Draw the Phasor diagram of a synchronous generator on load. Explain the meaning of synchronous reactance.
4. Explain any two position controller.
5. An 8-pole, 50Hz induction motor has a full load slip of 2.5 percent and maximum torque of twice the full load torque. At what value of slip does the maximum torque occur?
6. State with reasons applications of various types of D.C. motors.
7. Explain the load characteristics of a DC shunt generator.
8. Draw the signal flow graph for the following system and find the transfer function using mason gain formulae:
$$X_2 = a_{12} X_1 + a_{22} X_2 + a_{32} X_3$$
$$X_3 = a_{23} X_2 + a_{43} X_4$$
$$X_4 = a_{24} X_2 + a_{34} X_3 + a_{44} X_4$$
$$X_5 = a_{25} X_2 + a_{45} X_4$$

====END OF PAPER====