BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2019
(2nd Year, 1st Semester)

ELECTRICAL MACHINES – I

Time : Three Hours   Full Marks : 100

(50 marks for each part)
Use a separate Answer Script for each part.

PART – I

Answer any three questions.

Two marks are for well-organized answer.

1. a) Derive an expression for induced emf of a transformer.   4

    b) What are two general types of transformers? Discuss their constructional differences and   4
    relative advantages and disadvantages.

    c) Why the primary of a transformer draws current from the mains when the secondary is not   2
    carrying any load?

                                                                                                6
    d) Draw the phasor diagram of a single phase transformer supplying a lagging power factor
    load.

2. a) Develop the exact equivalent circuit of a single phase transformer. From this derive   8
    approximate and simplified equivalent circuits of a transformer. State the various
    assumptions made.

    b) Describe the tests on a single phase transformer that gives ohmic losses and core losses.   8
    Give the determination of the equivalent circuit parameters which can be determined form
    these tests.

3. a) Derive an expression for computing per-unit voltage regulation of a transformer for   12
    lagging power factor load.

    b) Define power efficiency and all-day efficiency of a transformer.   4

4. a) What is autotransformer? State the advantages and disadvantages of autotransformers over   6
    two-winding transformers.

    b) Derive an expression for saving in conductor material in a autotransformer over a two-   10
    winding transformer of equal rating.

5. a) What are the conditions for satisfactory parallel operation of single phase transformers?   4

    b) Two single-phase transformers are operating in parallel. Derive an expression for the   12
    current drawn by each, sharing a common load, when no-load voltages of these are not
    equal.

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Ref No. : Ex/EE/5/T/212/2019(Old)

Bachelor of Electrical Engineering(Evening) 2nd Year 1st Semester Examination,2019(Old)

SUBJECT : ELECTRICAL MACHINES-I   Page 1 of 2

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Question   **PART - I**   **Marks**
No.

Answer Question No.1 and any two from the rest.

1.

i) Lap connected D.C. machines require equalizer connection-Justify or correct.   **6x3**

ii) Due to armature reaction the magnetic neutral axis shifted against the direction of rotation for a D.C. generator – Justify or correct.

iii) D.C. shunt motor should not be operated under no load condition-Justify or correct.

iv) For low current and high voltage D.C. machines, lap connection is preferred-Explain.

v) D.C. shunt generator has poor voltage regulation than the D.C. separately excited generator- justify or correct.

vi) Swinburnes method of testing of D.C. machines is called regenerative test-Justify or correct.

2.

(i) What is armature reaction in D.C. machines and what are the methods of reducing the adverse effect of it ?   **8**

(ii) Explain the linear commutation in D.C. machines ?

8

3.

(i) Derive the speed-torque characteristic of D.C. shunt motor. Why D.C. shunt motors are extensively used in industry?   **8**

(ii)

A 220 V shunt motor on no-load runs at 1000 rpm and takes 10 A. The total armature and shunt field resistances are respectively 0.05 ohm and 110 ohms. Calculate the speed when loaded and taking a current of 50 A, if armature reaction weakens the field by 3%.   **8**

4

(i) Explain the external characteristics of D.C. shunt generator. Explain why differentially compound D.C. generator is used in welding application.

8

(ii) Discuss in brief the different methods of speed control of D.C. shunt motor.

5. **8**

(i) Derive the expressions of load shared by two D.C. shunt generators when operated in parallel. **8**

(ii) A shunt machine, connected to 240 V mains has an armature resistance of 0.03 ohm and resistance of the field winding is 120 ohms. Find the ratio of the speed as generator to the speed as a motor, the line current in each case being 80A. **8**