

FACULTY OF ENGINEERING

B.E. 2/4 (E & EE) II Semester (Main) Examination, May/June 2011

ELECTRICAL MACHINERY – I

Time : 3 Hours]

[Max. Marks : 75

Note : Answer **all** questions of Part – A. Answer **five** questions from Part – B.

PART – A

(Marks : 25)

1. Explain basic concept of magnetically induced emf. 3
2. Differentiate singly and multiple excited systems. 2
3. What do you understand by dummy coil ? For what purpose these dummy coils are used in d.c. machines ? 3
4. Why armature core is laminated ? 2
5. When D.C. shunt motor is operating under normal condition, what happens when suddenly field winding opened ? 2
6. What are the various effects of armature reaction ?
7. What are the various losses of D.C. machines ?
8. Draw circuit diagram for a Swinburne's Test conducted on d.c. machine. 2
9. Derive the expression condition for maximum efficiency of a transformer. 3
10. Draw vector diagram for a transformer on NO-LOAD. 2

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PART – B

(Marks : 50)

11. Explain the following terms with neat diagrams and necessary equations : 10
 - (a) Principles of Electro-mechanical energy conversion.
 - (b) Energy in magnetic system.
 - (c) Field energy and mechanical force.
12. (a) A 20 kW compound generator works on full-load with a terminal voltage of 250 V. The armature, series and shunt windings have resistance of 0.05 Ω , 0.025 Ω and 100 Ω respectively. Calculate the total emf generated in the armature when the machine is connected as short shunt. 5
- (b) Explain basic theory of commutation of d.c. machines with necessary diagrams. 5

(This paper contains 2 pages)

13. A 120 V d.c. shunt motor having an armature circuit resistance of 0.2Ω and field circuit resistance of 60Ω , draws a line current of 40 A at full load. The brush volt drop is 3 V and rated full-load speed is 1800 rpm. Calculate 10
- Speed at $\frac{1}{2}$ load.
 - Speed at overload of 125%.

14. (a) Explain Hopkinson's test with neat circuit diagram and derive necessary equations. 5
- (b) Hopkinson's test on two identical shunt machines gave the following readings : 5
- Supply voltage = 240 V; Field currents = 6A and 5A;
Line current = 40 A; Armature current of motor = 240 A;
Armature resistance of each machine = 0.014Ω ;
Voltage drop/brush = 1 V.
Calculate efficiency of each machine.

15. A single phase 10 kVA, 2000/200 V, 50 Hz transformer has the following test results : 10

Test	Voltmeter Reading	Ammeter reading	Wattmeter reading
O.C. test (LV side)	200 V	0.8 A	60 W
S.C. Test (H.V. side)	40 V	4 A	70 W

Evaluate the following :

- Find out all circuit parameters and draw its equivalent circuit of transformer.
 - Efficiency of transformer at $\frac{1}{2}$ load and at 0.8 p.f. lagging.
 - The load kVA at which maximum efficiency occurs and also maximum efficiency at 0.8 p.f. lagging.
 - Voltage regulation at 0.8 p.f. lagging and 0.8 p.f. loading at full load condition.
16. Explain the following with neat schematic diagrams : 5 + 5
- Retardation test on d.c. machine
 - Sumpner's test on 1-phase transformers.
17. Write short notes on the following : 4 + 3 + 3
- Torque equation of d.c. motor.
 - emf equation of d.c. machine.
 - Flow of energy in electromechanical devices.