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Question Paper Code : 51501

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electrical and Electronics Engineering

EE 2251/EE 42/EE 1251 A/10133 EE 402/080280003 – ELECTRICAL MACHINES – I

(Regulations 2008)

(Common to PTEE 2251 – Electrical Machines – I for B.E. (Part-Time)

Third Semester Electrical and Electronics Engineering Regulations 2009)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Define magnetic flux along with its unit.

2. A coil of 1500 turns carrying a current of 5 Amps produces a flux of 2.5 mWb. Find the self Inductance of the coil.

3. Differentiate between a core and shell type transformer.

4. What is the basic purpose of tertiary winding ?

5. What do you mean by co-energy ?

6. Give examples for multiple excitation systems.

7. Why is neutralization required in tuned amplifiers ?

8. Define the threshold points in a Schmitt trigger circuit.

9. Define commutation.

10. Why is DC series motor not suitable for belt driven loads ?

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Explain the losses in magnetic materials. **(10)**

(ii) The field winding of dc electromagnets is wound with 800 turns and has a resistance of 40 Ω when exciting voltage is 230 volt, magnetic flux around the coil is 0.004 Wb. Calculate self inductance and energy stored in magnetic field. **(6)**

OR

(b) (i) Derive the expression for self and mutual inductance of the coil. **(8)**

(ii) Two coils A and B are wound on same iron core. There are 600 turns on A, and 3600 turns on B. The current of 4 Amps through coil. A produces a flux of 500×10^{-6} Wb in the core. If this current is reversed in 0.02 second. Calculate average emf induced in coils A and B. **(8)**

12. (a) (i) Explain the principle of operation of a transformer. Derive its emf equation. **(8)**

(ii) A 1-phase transformer has 180 turns respectively in its secondary and primary windings. The respective resistances are 0.233 and 0.067. Calculate the equivalent resistance of

(1) the primary in terms of the secondary winding.

(2) the secondary in terms of the primary winding, and

(3) the total resistance of the transformer in terms of the primary. **(8)**

OR

(b) (i) Draw the phasor diagram of transformer when it is operating under load and explain. **(8)**

(ii) The parameters of approximate equivalent circuit of a 4 KVA, 200/400 V, 50 Hz, 1 ϕ transformer are : $R_p' = 0.15\ \Omega$; $X_p' = 0.37\ \Omega$; $R_o = 600\ \Omega$; $X_m = 300\ \Omega$. When a rated voltage of 200 V is applied to the primary, a current of 10 A at lagging power factor of 0.8 flows in the secondary winding. Calculate

(1) The current in the primary, I_p

(2) The terminal voltage at the secondary side. **(8)**

13. (a) (i) Draw the circuit diagram of a single tuned amplifier and explain the circuit operation. Also derive the expression for its frequency of oscillation. **(10)**

(ii) Discuss the effect of cascading tuned amplifiers. **(6)**

OR

(b) (i) Explain the working of stagger tuned amplifiers with appropriate derivations. **(10)**

(ii) Explain the instability of tuned amplifiers and explain any one technique for stabilization. **(6)**

14. (a) (i) Derive an expression for the generated voltage of d.c. machine. **(8)**

(ii) Calculate the fundamental, third and fifth harmonic breadth factors for a stator with 36 slots wound for 3-phase, 4-pole. **(8)**

OR

(b) A 3-phase, 50 Hz, star-connected alternator with 2-layer winding is running at 600 rpm. It has 12 turns/coil, 4 slots/pole/phase and a coil-pitch of 10 slots. If the flux/pole is 0.035 Wb sinusoidally distributed, find the phase and line emfs induced. Assume that the total turns/phase are series connected. **(16)**

15. (a) (i) Draw and explain the load characteristics of D.C. shunt and compound (cumulative and differential) generators. **(6)**

(ii) In a 110 V compound generator the resistances of the armature shunt and series field windings are 0.06 Ω, 25 Ω and 0.04 Ω respectively. The load consists of 200 lamps each rated at 55 W, 110 V. Find the total electromotive force and armature current when the machine is connected long shunt and short shunt. **(10)**

OR

(b) (i) Give the reasons for using starters to start D.C. motors. **(3)**

(ii) Draw the circuit of any one type of starter and explain its operation. **(5)**

(iii) A series motor of resistance 1 Ω between terminals runs at 800 rpm at 200 V with a current of 15 A. Find the speed at which it will run when connected in series with a 5 Ω resistance and taking the same current at the same supply voltage. **(8)**
