Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 50481

B.E./B.Tech./B.Arch. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017
Fourth Semester
Electrical and Electronics Engineering
EE 6401 – ELECTRICAL MACHINES – I
(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define Magnetic flux density.
2. Define Self Inductance.
3. List out the merits and demerits of core and shell type transformer.
4. How do you reduce leakage flux in a transformer ?
5. State the principle of electromechanical energy conversion.
6. Predominant energy storage occurs in the air gap of an electromechanical energy conversion device. Is this statement correct ?
7. What is the purpose of yoke in a D.C. machine ?
8. What is critical resistance of a D.C. Shunt generator ?
9. What will happen to the speed of a D.C. motor when its flux approaches zero ?
10. Mention the effects of differential compounding and cumulatively compound on the performance of D.C. compound motor.

PART – B (5×13=65 Marks)

11. a) For the magnetic circuit shown in Fig. 11 (a), with a core thickness of 5 cm, exciting current of 0.5A wound with 1000 turns coil, find the flux density and flux in each of the outer limbs and the central limbs. Assume relative permeability for iron of the core to be a) infinity b) 4500. **(13)**

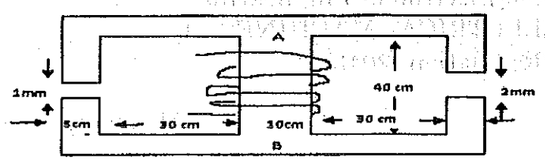

Fig. 11 (a)

(OR)

b) Draw and explain the typical magnetic circuit with air-gap and its equivalent electric circuit. Hence derive the expression for air gap flux. **(13)**

12. a) Explain the principle of operation of a transformer. Derive its EMF equation. **(13)**

(OR)

b) Draw and explain the phasor diagram of transformer when it is operating under load. **(13)**

13. a) The electromagnetic relay shown in Fig. 13 (a) is excited from a voltage source of $v = \sqrt{2}\ V \sin\omega t$. Assuming the reluctance of the magnetic circuit to be constant, find the expression for the average force on the armature, when the armature is held fixed at distance x. **(13)**

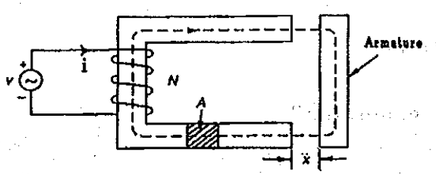

Fig. 13 (a)

(OR)

b) Discuss in detail the production of mechanical force for an attracted armature relay excited by an electric source. **(13)**

14. a) A separately excited generator when running at 1000 r.p.m. supplied 200A at 125 V. What will be the load current when the speed drops to 800 r.p.m. if I_f is unchanged ? Given that armature resistance = 0.04 Ω and brush drop = 2 V. Derive the necessary equations. **(13)**

(OR)

b) Explain in detail about commutation and list out the various methods of improving commutation in detail with a neat sketch. **(13)**

15. a) Draw the neat sketch of 3 point starter and explain its working. **(13)**

(OR)

b) Explain the different methods of speed control of dc shunt motor with neat circuit diagrams. **(13)**

PART – C (1×15=15 Marks)

16. a) A 75 KVA transformer has 500 turns primary and 100 turns secondary. The primary and secondary resistances are 0.4 Ω and 0.02 Ω respectively and the corresponding leakage reactances are 1.5 Ω and 0.045 Ω respectively. The supply voltage is 2200V. Calculate a) equivalent impedance referred to the primary circuit and b) the voltage regulation and secondary terminal voltage for full load at power factor of i) 0.8 lagging and ii) 0.8 leading.

(OR)

b) A toroidal core made of mild steel has a mean diameter of 16 cm and a cross-sectional area of 3 cm^2. Calculate a) the m.m.f to produce a flux of 4×10^{-4} Wb and b) the corresponding values of the reluctance of the core and the relative permeability.

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