G 1610 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Fourth Semester

Branch : Electrical and Electronics Engineering

ELECTRICAL MACHINES—I (E)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. What is armature reaction ? What are its effects ?
2. What do you mean by excitation of a d.c. machine ?
3. Why the voltage drop due to load in a d.c. separately excited generator is less than in a d.c. shunt generator ?
4. Explain power flow diagram of a d.c. generator.
5. Explain the flux control method for the speed control of d.c. shunt motor.
6. What are the advantages and disadvantages of Hopkinson test ?
7. Why the transformer cores are laminated ?
8. How harmonics are produced in a transformer ? What are its effects ?
9. Explain all day efficiency ?
10. Compare the weight of coper used in a two-winding transformer and an autotransformer.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Define the following terms with reference to armature winding of d.c. machine :

(i) Pole pitch ; (i) Front pitch ; and (iii) Commutator pitch.

(6 marks)

Turn over

(b) Find the number of turns required on each commutating pole of a 5 kW, 230 V, 4 pole sep
excited d.c. generator having a wave connected armature with 564 conductors. The flux
in the commutating pole air gap is 0.15 Wb/m.^{2} at full-load and length of gap is 0.
Neglect the ampere-turns required for iron parts of the commutation pole magnetic c

(6 r

Or

12. (a) Differentiate between lap winding and wave winding.

(4 m

(b) An 8-pole lap wound armature rotated at 350 rpm is required to generate 260 V. The
flux per pole is 0.05 Wb. The armature has 120 slots. Calculate a suitable number of cond
per slot and hence determine the actual value of flux required to generate the same vo

13. (a) Explain how armature reaction produces cross magnetisation and demagnetisation effe

(8 m

(b) A 110 V d.c. shunt generator delivers a load current of 50 A. The armature resitance is
and the field circuit resistance is 55 Ω. The generator rotating at a speed of 1800 rpm
6 poles lap wound and has a total of 360 conductors. Calculate

(6 ma

(i) the no-load voltage in the armature; and

(ii) the flux per pole.

Or

(6 mar

14. (a) Explain the methods of improving commutation with relevant figures.

(6 mar

(b) A 440 V d.c. compound generator has an armature, series field, and shunt field resistances
0.5 Ω, 1.0 Ω and 200 Ω respectively. Calculate the generated voltage while delivering 40 A
external circuit for both long shunt and short shunt connections.

15. (a) What are the drawbacks of three-point starter ? Describe a four-point starter with a ne
sketch.

(6 mark

(b) A 4-pole d.c. shunt motor working on 250 V takes a current of 2A when running at 1000 rpn
What will be its back emf, speed and percentage speed drop if the motor takes 51A at
certain load ? Armature and shunt field resistances are 0.2 Ω and 250 Ω respectively.

(6 mark

Or

(6 marks

16. (a) What are the losses that occur in d.c. machines ? Derive the condition for maximum efficiency
of a d.c. machine.

(6 marks)

(b) When running on no-load, a 400 V shunt motor takes 5A. Armature resistance is 0.5 Ω and field resistance 200 Ω. Find the output of the motor and efficiency when running on full-load and taking a current of 50 A. Also, find the percentage change in speed from no-load to full load.

(6 marks)

17. (a) Explain different methods of cooling of transformers. (4 marks)

(b) A 100 kVA transformer is provided with tap changer on the primary side. Find the tap setting, for maintaining rated voltage on the secondary side for loads of (i) 90 kVA at 0.8 pf lag and (ii) 100 kW at 0.8 pf lag (pu leakage impedance of transformer is $0.0075 + j\ 0.09$).

(8 marks)

Or

18. The full-load voltage drops in a 1ϕ transformer are 2 % and 4 % respectiely due to resistance and leakage reactance. The full-load ohmic loss is equal to the iron loss. Calculate :

(i) The efficiency on full-load at UPF ;

(ii) The full-load pf at which voltage drop is maximum; and

(iii) The load pf at which voltage drop is zero.

(3 × 4 = 12 marks)

19. (a) Explain, with the help of phasor diagram, how two-phase supply can be obtained from three-phase supply using Scott connection.

(6 marks)

(b) A 11500/2300 V transformer is rated at 100 kVA as a two-winding transformer. If the windings are connected in series to form an autotransformer, what will be the possible voltage ratios and output ? Also calculate the saving in conductor material.

(6 marks)

Or

20. A 3-phase, step down transformer is connected to a 6.6 kV mains and takes 10 A. Calculate the secondary line voltage, line current and output for the following connection if ratio of turns/phase = 12 :

(i) Δ – Δ.

(ii) Δ – Y.

(iii) Y – Δ.

(iv) Y – Y.

[5 × 12 = 60 marks]