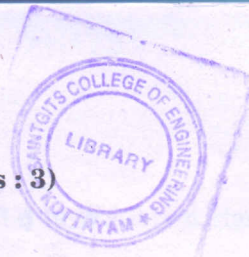


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Reg. No.....

Name.....

**B.TECH. DEGREE EXAMINATION, MAY 2015**

**Fourth Semester**

Branch : Electrical and Electronics Engineering

EE 010 402—DC MACHINES AND TRANSFORMERS (EE)

(New Scheme – 2010 Admission Onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

**Part A**

*Answer all questions.*

*Each question carries 3 marks.*

1. What is armature reaction ? List out various methods to nullify.
2. A 4-pole, wave-connected armature of a d.c. machine has 750 conductors and is driven at 720rev/min. If the useful flux per pole is 15 mWb, determine the generated e.m.f.
3. What is the meaning of “electrical angle” ? How it is difference from mechanical angle and also express the relation between this two ?
4. 33kVA, 2200/220V 1-phase Transformer has  $r_1 = 2.4\Omega$ ,  $x_1 = 6.00 \Omega$ , and  $r_2 = 0.03\Omega$ ,  $x_2 = 0.07 \Omega$ , Find equivalent resistance and reactance with respective primary.
5. Why the rating of transformer in kVA ? Explain.

(5 × 3 = 15 marks)

**Part B**

*Answer all questions.*

*Each question carries 5 marks.*

6. What is commutation in dc machine ? Explain with neat diagram and also write how to improve commutation.
7. The armature of 4 pole-lap wound DC machine has core length = 30 cm, diameter = 40 cm total conductors = 500, speed = 1200 r.p.m., current = 20 A. For an average flux density of 0.5T, find electromagnetic power developed and the internal torque.
8. Differentiate between two point starting and three point starting.
9. What is the need of connecting transformer in parallel ? Explain how the total load will be shared with example.
10. A 5 kVA single phase transformer has a core loss of 40W and full load ohmic loss of 100W. The daily variation of load on the transformer is as follows :—

7 am to 1 pm     ...     3 kW at p.f. 0.6

1 pm to 6 pm     ...     2 kW at p.f. 0.8

**Turn over**



6 pm to 1 am	...	6 kW at p.f. 0.9
1 am to 7 am	...	No load

Find all day efficiency of the transformer.

(5 × 5 = 25 marks)

### Part C

Answer all questions.

Each full question carries 12 marks.

11. Derive the torque equation of a DC motor. A separately-excited generator develops a no-load e.m.f. of 150V at an armature speed of 20 rev/s and a flux per pole of 0.10 Wb. Determine the generated e.m.f. when (a) the speed increases to 25rev/s and the pole flux remains unchanged ; (b) the speed remains at 20 rev/s and the pole flux is decreased to 0.08 Wb ; and (c) the speed increases to 24 rev/s and the pole flux is decreased to 0.07 Wb.

Or

12. Explain the construction and working principle of the DC motor.
13. A 6-pole lap-wound DC generator has 240 coils of 2 turns each. Resistance of one turn is 0.03 Ω. The armature is 50 cm long and 40 cm diameter. Air-gap flux density of 0.6 T is uniform over pole shoes. Each pole subtends an angle of 40° mechanical. For armature speed of 1200 rpm, find (a) generated EMF at no load and (b) the terminal voltage at full load armature current of 40 A.

Or

14. A 6-pole, 148 A DC shunt generator has 480 conductors and is wave-wound. Its field current is 2 A. Find the demagnetizing and cross-magnetizing ampere turns per pole at full load if :
- Brushes are on GNA
  - Brushes are shifted from GNA by 5° electrical
  - Brushes are shifted from GNA by 5° mechanical
15. List out various tests to on dc machines. Explain Swinburne's test.

Or

16. A 230 V dc shunt motor, takes an armature current of 3.33 A at rated voltage and at a no-load speed of 1000 r.p.m. The resistance of armature circuit and field circuit are respectively 0.3Ω and 160 Ω. The line current at full load and rated voltage is 40 A. Calculate, at full load the speed and the developed torque in case the armature reaction weakens the no load flux by 4%.
17. (a) Derive the expression for maximum efficiency of transformer and explain when it occurs ?
- (b) The maximum efficiency of a 500 kVA, 3300/500V, 50 Hz, single phase transformer is 97% and occurs at 3/4<sup>th</sup> full-load u.p.f. if the impedance is 10%, calculate the regulation at  $\frac{1}{2}$  of full load at 0.8 p.f. lag.

Or



18. Explain OC and SC tests of transformer and also explain significance of each test.
19. (a) What is the name of the connection that converts 3- $\phi$  to 2- $\phi$ ? Explain with neat diagram and also derive how it is converted into 2- $\phi$ .
- (b) Briefly explain the cooling arrangement of transformer.

*Or*

20. Explain types of tap changing methods of transformer. Also write advantages and disadvantages in each case, select which is best method in practice.

(5 × 12 = 60 marks)

