



C09-EE-304

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**BOARD DIPLOMA EXAMINATION, (C-09)
MARCH/APRIL—2018
DEEE—THIRD SEMESTER EXAMINATION**

DC MACHINES AND BATTERIES

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

- Instructions :** (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. List the features of wave winding.
2. Write the principle of working of a DC generator.
3. What are the conditions to build up voltage in a self-excited DC generator?
4. List the applications of DC generators.
5. Write the applications of DC motors.
6. Draw the power stage diagram of DC motor.
7. Briefly explain the protective devices used in DC starters.

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8. List the different methods of speed control of DC series motor.
9. State the indications of fully-charged battery.
10. Write in brief about trickle charging.

PART—B

10×5=50

Instructions : (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. (a) Derive the EMF equation of a DC generator. 5
- (b) A 100 kW, 240 V shunt generator has a field resistance of 55 and armature resistance of 0.069 . Find the full load generated voltage. 5
12. (a) What is meant by demagnetization and cross-magnetization effect in a DC generator? 5
- (b) A 250 V, 25 kW, 4-pole DC generator has 328-wave connected armature conductors, when the machine is delivering full load, the brushes are given a lead of 7.2 electrical degrees. Calculate (i) demagnetizing AT/Pole and (ii) cross-magnetizing AT/Pole. 5
13. (a) Derive the demagnetizing AT required to overcome demagnetizing effect. 5
- (b) A 8-pole lap connected DC shunt generator delivers an output of 240 A at 500 V. The armature has 1408 conductors and 160 commutators segments. If the brushes are given a lead of 4 segments from the no-load neutral axis, estimate the demagnetizing and cross-magnetizing AT/Pole. 5

14. A 4-pole DC shunt motor has a flux per pole of 0.04 Webers and the armature is lap wound with 720 conductors. The shunt field resistance is 240 ohms and the armature resistance is 0.2 ohm. Brush contact drop is 1 V/brush. Determine the speed of the machine when running, (i) as motor taking 60 A, and (ii) as generator supplying 120 A. The terminal voltage in each case is 480 V. 10
15. (a) Why is starter required for a DC motor? 5
 (b) Write the function of no-volt coil (NVC) and over load coil (OLC) in a 3-point starter. 5
16. Explain the method of conducting Swinburne's test with neat diagram. 10
17. Explain the construction of lead acid cell, and write charging and discharging chemical equations of lead acid cell. 10
18. (a) Derive the condition for maximum efficiency of a DC generator. 5
 (b) An alkaline cell is discharged at a steady current of 4 A for 12 hours, the average terminal voltage being 1.2 V. To restore it to its original state of charge, a steady current of 3 A for 20 hours is required the average terminal voltage being 1.44 V. Calculate the ampere-hour efficiency and watt-hour efficiency in this particular case. 5

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