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**Question Paper Code: 43302**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Third Semester

Electrical and Electronics Engineering

14UEE302 - DC MACHINES AND TRANSFORMERS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- The principle of dynamically induced emf is utilised in
  - Choke
  - Transformer
  - Generator
  - Thermocouple
- Hysteresis loss can be minimised by selecting a magnetic material having
  - large B/H loop area
  - High resistivity
  - High retentivity
  - Low hysteresis coefficient
- Which generator has poorest voltage regulation?
  - Series
  - Shunt
  - Long shunt compound
  - Short shunt compound
- Interpole winding is connected in
  - Series with armature
  - Series with main poles
  - Parallel with armature
  - Parallel with main poles
- The speed of the dc motor can be controlled by varying
  - Its flux per pole
  - Resistance of armature circuit
  - Applied voltage
  - All of the above

6. The direction of rotation of conductors of a DC motor can be determined by
- (a) Ampere law (b) Fleming's left hand rule  
(c) Fleming's right hand rule (d) Lenz's law
7. If a transformer primary is energised from a square wave voltage source, its output voltage will be
- (a) Square wave (b) Sine wave  
(c) Pulse wave (d) Triangular wave
8. Transformer action requires a
- (a) Constant magnetic flux (b) Increasing magnetic flux  
(c) Alternating magnetic flux (d) Alternating electric flux
9. One of the main advantages of Swinburne's test is that it
- (a) its applicable for shunt motors (b) needs one running cost  
(c) its very economical and convenient (d) ignore any charge in iron loss
10. The main purpose of performing open-circuit test on a transformer is measure its
- (a) cu loss (b) core loss  
(c) total loss (d) insulation resistance

PART - B (5 x 2 = 10 Marks)

11. What is co-energy? What is it's use?
12. What are cumulative and differential compound generators?
13. Write the torque equation of a dc motor.
14. Define all-day efficiency.
15. What are the losses in a DC machines?

PART - C (5 x 16 = 80 Marks)

16. (a) Derive an expression for mechanical force developed by magnetic field. (16)
- Or
- (b) (i) Explain the concepts of rotating magnetic field. (8)
- (ii) Obtain the torque equation for round rotor machines. (8)

17. (a) Explain with a neat sketch, the construction of a dc machine. (16)

Or

(b) (i) An 8 pole lap connected DC shunt generator delivers an output of 240 A at 500V. The armature has 1408 conductors and a 60 commutator segments. If the brushes are given a lead of 4 segments from no-load neutral axis estimate the demagnetizing and cross magnetizing AT/pole. (8)

(ii) Estimate the reactance voltage for a D.C shunt machines having 55 commutator segments brush width in commutator segments of 4cm, self-inductance of 0.153mh and current per coil of 27A. The speed of the machine is 700 rpm. (8)

18. (a) Sketch and explain the speed-current, speed-torque and torque-current characteristics of a shunt motor, series motor and compound motor. (16)

Or

(b) Explain the different methods used for the speed control of dc shunt motor. (16)

19. (a) Draw the no-load phasor diagram of a transformer and explain. (16)

Or

(b) The primary and secondary windings of a 30KVA, 6.6 KV/230V transformer have resistance of  $10\Omega$  and  $0.013\Omega$  respectively. The leakage reactance of the windings are  $17\Omega$  and  $0.022\Omega$ . Estimate the percentage voltage regulation of the transformer when it is delivering full-load at 0.8 power factor lagging at the rated voltage. (16)

20. (a) Explain any two methods of testing of DC machines. (16)

Or

(b) (i) What are the losses occurring in transformer and explain. (8)

(ii) Derive the condition for maximum efficiency in a transformer? (8)

