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**Question Paper Code: 41306**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Fourth Semester

Electronics and Instrumentation Engineering

14UEE426 - PRINCIPLES OF ELECTRICAL MACHINES

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- The purpose of commutator in dc generator is to
  - increase output voltage
  - reduce sparking at brushes
  - provide smooth output
  - convert ac to dc
- \_\_\_\_\_ is used in electric locomotives
  - DC shunt motor
  - DC series motor
  - DC compound motor
  - Induction motor
- Transformer cores are laminated in order to
  - simplify its construction
  - minimize eddy current loss
  - reduce cost
  - reduce hysteresis loss
- A step up transformer increases
  - Voltage
  - Current
  - Power
  - Frequency
- The principle of operation of a 3 phase induction motor is most similar to that of
  - synchronous motor
  - repulsion-start induction motor
  - transformer with a shorted secondary
  - capacitor-start, induction-run motor

6. The frequency of the rotor current in a  $3\Phi$ , 4pole,  $50Hz$  induction motor at full load speed is about
- (a) 50 Hz                      (b) 20 Hz                      (c) 2 Hz                      (d) Zero
7. The damping winding in a synchronous motor is generally used
- (a) to provide starting torque only  
(b) to reduce noise level  
(c) to reduce eddy currents  
(d) to prevent hunting and provide the starting torque
8. A synchronous machine is called as doubly excited machine because
- (a) It can be over excited  
(b) It has two sets of rotor poles  
(c) Both its rotor and stator are excited  
(d) It needs twice the normal exciting current
9. Which motors are preferred for refrigeration and air conditioning in smaller units
- (a) Induction motors                      (b) Universal motors  
(c) Reluctance motors                      (d) Stepper motors
10. Which of the following motor is used in mixies?
- (a) repulsion motor                      (b) reluctance motor  
(c) hysteresis motor                      (d) universal motor

PART - B (5 x 2 = 10 Marks)

11. What is back emf in DC motor?
12. Calculate the half full load copper loss of a transformer with full load copper loss of 400W.
13. Draw the Torque – Slip characteristics of  $3\Phi$  induction motor.
14. Define synchronous speed. How is it related to the frequency of generated emf?
15. What is the function of centrifugal switch in a single phase induction motor?

PART - C (5 x 16 = 80 Marks)

16. (a) Illustrate the construction and principle of operation of DC generator with the aid of neat sketch. (16)

Or

(b) Explain briefly the working of three point starter and four point starters. (16)

17. (a) Analyze the equivalent circuit of a single phase transformer with the phasor diagrams for loaded conditions. (16)

Or

(b) Explain about how equivalent circuit parameters can be determined for a  $1\Phi$  transformer using OC and SC tests conducted on them. (16)

18. (a) Derive the condition for maximum running torque of a  $3\Phi$  induction motor and obtain the expression for it. (16)

Or

(b) Compare squirrel cage induction motor with slip ring induction motor with reference to construction, performance and application. (16)

19. (a) Describe the construction and principle of slow speed operation generator with neat diagram. (16)

Or

(b) Explain the principle of operation of synchronous motor. (16)

20. (a) Explain any two types of single phase induction motors. (16)

Or

(b) Discuss the construction and various modes of excitation of variable reluctance stepper motor. (16)

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