Register Number.....

B.E. DEGREE EXAMINATIONS: APRIL / MAY 2009

Fourth Semester

ELECTRONICS AND INSTRUMENTATION ENGINEERING

UO7EI 302 Electrical Machines

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (20 x 1 = 20 Marks)

1. Which loss in a DC Generator significantly varies with the load current?

   (A) Armature copper loss (B) Field copper loss

   (C) Windage loss (D) Frictional losses

2. The conductors of a dc machine are

   (A) Welded to armature (B) soldered to armature

   (C) Firmly placed in slots (D) wound round the armature core.

3. A dc generator running at 1600 rpm gives 240 V dc. If the speed is dropped to 1400 rpm without change in flux the new emf will be

   (A) 270 V (B) 240 V (C) 237 V (D) 210 V

4. Which motor will have least percentage increase of input current for the same percentage increase in torque?

   (A) Series motor (B) Shunt motor

   (C) Separately excited motor (D) cumulatively compounded motor.

5. Which of the following is used to absorb moisture from air entering the transformer?

   (A) sodium chloride (B) silica sand (C) felt pad (D) silica gel

6. In a step down transformer

   (A) secondary turns are less than primary turns

   (B) secondary power is less than primary power

   (C) phase shift 180

   (D) secondary current is always more than primary current

7. Which of the following is not a routine test on transformer?

   (A) polarity test (B) Radio interference test

   (C) core insulation test (D) impedance test.

8. The efficiency of a 430/200 V transformer at full load 0.8 p.f lagging is 95%. The efficiency at full load at 0.8 p.f leading will be

   (A) 99% (B) 95.5% (C) 95% (D) 90 %

9. If the supply frequency for an induction motor is increased by 5%, the synchronous speed will

   (A)decrease by 10 % (B) decrease by 5% (C) increase by 5% (D) increase by 10%

10. Which of the following parameters of an induction motor varies inversely as the supply frequency?

(A) Full load speed (B) starting current (C) slip (D) Maximum running torque

11. In an induction mo0tor if air gap is more

(A) speed will drop (B) efficiency of motor will improve

(C) power will be low (D) reduction in slip

12. The speed of a 60 Hz 14 pole, motor with slip of 0.05 will be

(A) 976 rpm (B) 488 rpm (c) 244 rpm (D) 122 rpm

13. With the increase in the excitation current of synchronous motor the power factor of the motor will

(A) Improve (B) decrease (C) remain constant (D) depend on other factors

14. In a synchronous motor, the torque angle is

(A) the angle between the rotating stator flux and rotor poles.

(B) the angle between magnetizing current and back emf

(C) the angle between the supply voltage and the back emf.

(D) the angle between the supply voltage and field current.

15. The power factor of an alternator depends on

(A) Load (B) speed of rotor (C) core losses (D) Armature copper loss

16. The armature reaction of an alternator influences

(A) Windage losses (B) operating speed

(C) Generated voltage per phase (D) waveform of voltage generated

17. Which of the following is usually not the generating voltage?

(A) 6.6 kV (B) 9.9 kV (C) 11 kV (D) 13.2 kV

18. Pin insulators are normally used upto voltage of about

(A) 100 kV (B) 66 kV (c) 33 kV (D) 25 kV

19. Which distribution system is more reliable?

(A) ring main system (B) tree system (c) radial system (D) all are equally reliable

20. Permissible variation in frequency is

(A) ±0.1% (B) ± 1% (C) ± 5% (D) ± 10%

PART B (5 X 16 = 80 Marks)

21. (a) i) Derive the EMF equation of a DC Generator. (8)

ii) A 220 V Shunt motor has an armature resistance of 0.5 Ω and takes an armature current of 40 A on a certain load. By how much must be the flux be reduced to raise the speed by 50 %, if the developed torque is constant? Neglect saturation and armature reaction. (8)

(OR)

(b) i) Derive the torque equation of a DC motor thereby explain how DC motors are classified. (8)

ii) In a 220 V DC compound generator, the resistance of the armature, series and shunt windings are 0.12 Ω, 0.08 Ω and 55 Ω respectively. The generator supplies power to 200 lamps each rated at 60 W, 220 V. Find the emf and armature current when the machine is connected at i) short shunt and ii) long shunt. Allow brush contact drop of 2 V. (8)

22. (a) i) Derive the EMF equation of a single phase transformer. (6)

ii) A 220/440 V single phase transformer has the following test data.Open circuit test: 220 V, 1.0 A 70 W on LV side.Short circuit test : 20 V, 12 A, 100 W on HV side.Draw the equivalent circuit of the transformer refereed to i) LV side and ii) HV side and fill in the values of circuit parameters. (10)

(OR)

22. (b) i) Explain the constructional details of a three phase Power transformer.Mention the importance of conservator, breather and other protective relay. (6)

ii) The maximum efficiency of a single phase 250 kVA, 2000/250 V transformer occurs at 80 % of full load and is equal to 97.5% at 0.8 p.f. Determine the efficiency and regulation on full load at 0.8 p.f if the impedance drop of the transformer is 9%. (10)

23 (a) i) Explain the principle of operation of single-phase capacitor start induction motor with necessary phasor diagram. (8)

ii) Derive the torque equation of a three phase induction motor (8)

(OR)

23 (b) i) Draw the equivalent circuit of a three phase Induction motor, thereby determine the following: a) Rotor copper loss (8)
b) Mechanical power output
c) Efficiency

ii) Explain the construction and operation of a single phase shaded pole induction motor with necessary diagram. (8)

24 (a) i) How the regulation of a three phase Alternator is pre determined by MMF method. Compare the same with Synchronous impedance method. (8)

ii) Explain the principle operation of a variable reluctance stepper motor. (8)

(OR)

24 (b) i) Derive the EMF equation of a three synchronous generator. Also explain the terms distribution factor and pitch factor (8)

ii) Explain the construction and principle operation of a Hysteresis motor (8)

25 (a) i) Compare the EHVAC and EHVDC system (8)

ii) Explain the basic structure of power system start from generation to consumer service. (8)

(OR)

25 (b) i) What are the various types of under ground cables? Explain the construction of any one cable with neat diagram. (8)

ii) Discuss in detail the various HVDC links and also explain the components of HVDC system (8)

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