Register Number.....

B.E. DEGREE EXAMINATIONS: OCTOBER / NOVEMBER-2008

Third Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U07EE 302: ELECTRICAL MACHINES 1

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

Answer ALL Questions:-

PART A (20x1=20marks)

1. Why is the armature of the dc machine is made of laminated silicon steel stampings
   A. To reduce hysteresis losses
   B. To reduce eddy current losses
   C. For the ease with which the slots can be created
   D. To achieve high permeability

2. Why is the pole shoe in a dc machine larger than its pole body?
   A. It gives sinusoidal flux density
   B. It provides a support for field winding
   C. It reduces iron loss in the pole shoes and gives a more nearly rectangular flux density wave
   D. It helps to make the flux density wave nearly sinusoidal

3. The armature reaction MMF in a dc machine is
   A. Sinusoidal in shape
   B. Trapezoidal in shape
   C. Rectangular in shape
   D. Triangular in shape

4. Open slots are used in dc machine armature because
   A. Of the ease with which the winding can be placed inside the slots
   B. It increases the induced emf per coil
   C. It reduces the armature voltage drop
   D It reduces the coil reactance emf and hence aids in commutation

5. Why are the pole tips in a dc machine chamfered?
   A. To improve commutation characteristics
   B. To reduce armature reaction effect
   C. To achieve nearly sinusoidal air gap flux density distribution
   D To increase induced emf per coil

6. A dc series motor should not be run at no load , because
   A. It will draw a dangerously large current
   B. It will stall
   C. It will run at a dangerously high speed
   D. It will draw a dangerously high current and dangerously high speed

7. A differentially compounded motor under high overload conditions will behave like
   A. A shunt motor
   B A series motor
   C A cumulative compound moto
   D An ac synchronous motor

8. The motor best suited for hoist and traction type load is the

A. Induction motor
B. Synchronous motor
C. Dc shunt motor
D. Dc series motor

9. What losses occur in the teeth of a dc machine armature?

A. Hysteresis loss only
B. Eddy current loss only
B. Hysteresis and Eddy current loss
D. No losses

10. In a dc generator, emf due to residual flux is fed back to the shunt winding Positively, why does the no-load voltage build up to a finite steady value?

A. Because of filed winding inductance
B. Because of magnetic saturation
C. Because of field winding resistance
D. Because of eddy-current in pole shoes

11. For a given torque, reducing the field turns of a dc series motor

A. Increases its speed, demanding more current
B. Increases its speed but armature current remains the same
C. Decreases its speed, demanding less armature current
D. Decreases its speed but armature current remains the same

12. Field control of a dc shunt motor gives

A. Constant torque drive
B. Constant kW drive
C. Constant speed drive
D. Variable load speed drive

13. Why is the yoke cross-section made larger than cross-section in a transformer?

A. To reduce mechanical strength
B. To reduce magnetizing current
C. To reduce core loss
D. To provide a better mechanical fit between yoke and core

14. No load current in a transformer:

A. Lags the applied voltage by 90 degrees
B. Lags the applied voltage by somewhat less than 90 degrees
C. Leads the applied voltage by 90 degrees
D. Leads the applied voltage by somewhat less than 90 degrees

15. The high frequency hum in the transformer is mainly due to:

A. Laminations being not sufficiently tight
B. Magnetostriction
C. Oil of the transformer
D. Tank walls

16. The amount of leakage flux in the transformer windings depends on:

A. The applied voltage
B. Turn ratio
C. The load current
D. The mutual flux

17. Sumpner's test on two identical transformers yields information about

A. Core loss only
B. Full load copper loss only
C. Both core loss and full-load copper loss
D. It yields no information on losses

18. The voltage regulation of a transformer at full load 0.85 pf lagging is 5%. Its voltage regulation at full load 0.85 pf leading:
   A. Will remain the same
   B. Will be positive
   C. Will reduce and may even become negative
   D. Will be negative

19. Non-Loading heat run test on transformers is performed by means of:
   A. SC test
   B. OC test
   C. Half time on SC and half time on OC
   D. Sumpner's test

20. Which of the following tests must be performed on a transformer to determine its leakage reactance?
   A. Both OC and SC tests
   B. OC test only
   C. SC test only
   D. Test by an impedance bridge

PART B (5 x 16 = 80 Marks)

21. (a)Explain with neat diagram construction and working principle of a dc generator and derive the emf equation **(16)**

(OR)

(b) (i) Explain the armature reaction in a DC machine and how this can be neutralized **(8)**

(ii) An 8-pole, lap connected armature has 960 conductors, a flux of 40×10^{-3} ωb per pole, and a speed of 400 rpm.Calculate the emf generated on open circuit. **(8)**

22. (a) (i) Derive from the first principle an expression for the torque developed in a dc motor **(8)**

(ii) A 4-pole dc motor is lap-wound with 400 conductors. The pole shoe is 20cm long and the average flux density over one-pole pitch is 0.4T, the armature diameter being 30cm.Find the torque and gross mechanical power developed when the motor is drawing 25A and running at 1500 rpm. **(8)**

(OR)

(b) (i) Explain the various methods of speed control of dc shunt motor **(8)**

(ii) Draw and explain the speed- torque characteristics of dc compound motor. **(8)**

23. (a) A 10kW, 250V, dc shunt motor with an armature resistance of 0.8Ω and a field resistance of 275Ω takes 3.91A, when running light at rated voltage and rated speed.
(i) What conclusions can you draw from the above data regarding machine losses?
(ii) Calculate the machine efficiency as a generator when delivering an output of 10kW at rated voltage and speed and as a motor drawing an input of 10kW. What assumptions if any do you have to make in this computation? **(16)**

(OR)

(b) The following test results were obtained while Hopkinton's test was performed on two similar dc shunt machines:

Supply voltage = 250V
Field current of Motor = 2A
Field current of generator = 2.5 A
Armature current of generator = 60A
Current taken by the two armature from supply = 15A
Resistance of each armature circuit = 0.2Ω

Calculate the efficiency of the motor and generator under these conditions of load. **(16**

24. (a) (i) Derive an emf equation of single phase transformer **(8)**

(ii) A 6600V/230V, 50Hz single phase core type transformer has a core section 25 cm X 25 cm. Calculate the approximate number of primary and secondary turns if the flux density in the core should not exceed 1.1 ωb/m^2. **(8)**

(OR)

(b) (i) Develop an approximate equivalent circuit for a two winding transformer. **(8)**

(ii)The primary and secondary windings of a 30 kVA, 6000V/230V transformer have resistances of 10 and 0.016Ω respectively. The total reactance of the transformer referred to the primary is 23Ω.Calculate the percentage regulation of the transformer when supplying full load current at a power factor of 0.8 lagging. **(8)**

25. (a) The iron loss and full load copper loss of a 30kVA transformer are 350W and 650W respectively. Calculate

(i) Full load efficiency
(ii) Output kVA corresponding to minimum efficiency and
(iii) Maximum efficiency, consider the power factor of the load is0.6lagging **(16**

(OR)

(b) (i) Derive an expression for the saving in copper effected by using an auto transformer instead of two winding transformer **(8)**

(ii) Explain the conditions for parallel operation of two single phase transformers **(8)**

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