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**Reg. No. :**

**Question Paper Code: 46032**

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

Sixth Semester

Electrical and Electronics Engineering

14UEE602 - ELECTRICAL MACHINE DESIGN

(Regulation 2014)

(Mention the charts, tables if necessary)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which is non-magnetic material.

(A) Nickel (B) Cobalt (C) Aluminium (D) Gadolinium.

2. Which of the following calls for intermittent duty with starting and braking?

(A) Pumps (B) Conveyors ( C) Wind lasses (D) Cranes.

3. In dc machines by increasing the number of poles, all of the following reduce except:

(A) weight of copper (B) weight of iron parts

(C) Frequency of flux reversals (D) overall size of the machine

4. The number of commutator segments in a dc machine is equal to the no. of

(A) coil-sides (B) turns (C) Coils (D) slots.

5. The stacking factor will be least for

(A) Square core (B) Cruciform core (C) Three stepped core (D) Four stepped core

6. The heat generated in the transformer is dissipated to the surroundings mainly by

(A) conduction (B) convection (C) Radiation (D) all of the above

7. Which types of slots are generally used in induction motors?.

(A) Open type (B) Semi-closed type (C) Closed type (D) None of the above.

8. In the design of induction motors, normally the number of slots per pole per phase is taken as

(A) two (B) three (C) Three or more (D) three or less.

9. In a synchronous generator in order to eliminate the fifth harmonic the chording angle should be

(A) 9° (B) 18° (C) 27° (D) 36°.

10. Damper windings are provided in synchronous machines

(A) damp out rotor oscillations

(B) reduce the over-voltages under abnormal conditions

(C) Facilitate starting (D) all of the above.

PART - B (5 x 2 = 10 Marks)

11. Define specific magnetic loadings.

12. Define field form factor.

13. Why the area of yoke of a transformer is usually kept 15-20% more than that of core?

14. How the induction motor can be designed for best power factor?

15. List the payment systems in M-Commerce.

PART - C (5 x 16 = 80 Marks)

16. (a) What are the main groups of electrical conducting materials? Describe the

properties and applications of those materials. (16) Or

(b) (i) Describe methods used for determination of motor rating for variable load drives

with suitable diagrams. (8)

(ii) Calculate specific magnetic loading of 100 HP ,3000V,3phase ,50Hz,8 pole star

connected ,flame proof induction motor having stator core length =0.5m and

stator bore =0.66m,turns/phase=286.Assume full load efficiency as 0.938 and

power factor as 0.86. (8)

17. (a) (i) Derive the output equation of a dc machine.. (8)

(ii) Derive the relation between real and apparent flux densities in a DC machines.

(8)

Or

(b) Find the main dimensions, number of poles and length of air gap of a 600KW, 500V, 900 rpm DC generator. Assume average gap density is 0.6 wb/ m2 and ampere conductors per meter 35000 .The ratio of pole arc to pole pitch is 0.75 and the efficiency is 85%.The mmf required for the air gap is 55% of armature mmf and gap contraction factor is 1.15.

The following are the design constraints: peripheral speed ≠>40 m/s, frequency

of flux reversal ≠>50 Hz, current per brush arm ≠> 400A, armature mmf per pole

≠> 7800 AT. (16)

18. (a) Derive the output equation of both single phase and three phase transformer from

basis and also explain to design the transformer for minimum losses. (16)

Or

(b) A 250 KVA, 6600/400 V, 3 Phase, core type transformer has a total loss of 4800

watts at full load. The transformer tank height is 1.25 m and 1 m \* 0.5 m in plan.

Design a suitable scheme for tubes if the average temperature rise is to be limited to

350C. The diameter of tubes is 50mm and is spaced 75mm from each other. The

average height of tubes is 1.05m.Specific heat dissipation due to radiation and

convection is respectively 6 and 6.5 W/m2/0C.Assume that convection is improved

by 35% due to provide of tubes. (16)

19. (a) Find the main dimensions of a 15KW, 3 phase, 400V, 50Hz, 2810 rpm squirrel cage

induction motor having an efficiency of 0.88 and a full load power factor of

0.9.Assume:Bav=0.5wb/m2,ac=25000amp.cond/meter. Take rotor peripheral speed

as approximately 20m/s at synchronous speed. (16)

Or

(b) A 15KW ,440V,4pole,50Hz,3 phase induction motor is built with a stator bore

0.25m and a core length of 0.16m .The specific electric loading is 23000 ac/m.Using

the data of this machine, determine the core dimensions, number of stator slots and

number of stator conductors for 11Kw,460V,6 pole,50Hz motor. Assume a full load

efficiency of 84% and power factor of 0.82 for each machine. The winding factor is

0.955 (16)

20. (a) (i) Derive the output equation of synchronous machine. (6)

(ii) Compute the main dimensions of a 1000KVA, 50Hz, 3Phase, 375rpm alternator.

The average air gap density is 0.55wb/m2 and the ampere conductors per metre

are 28000.Use rectangular poles. Assume the ratio of core length to pole pitch

equal to 2.Maximum permissible peripheral speed is 50m/sec. The runaway

speed is 1.8 times the synchronous speed. (10) Or

(b) A 1000 KVA, 3300V, 50Hz, 3 phase alternator has 180 slots with 5 conductors per

slot. Single layer winding with full pitch coils is used. The winding is star connected

with one circuit per phase .Determine the specific electric and magnetic loadings, if

the stator bore is 2.0m and core length is 0.4m .The machine has 60° phase spread.

(16)