Code No. 5099 / A

FACULTY OF ENGINEERING

B.E. 4/4 (E & EE) I - Semester **(Main)** Examination, December 2011

Subject : **Electric Machine Design**

Time : 3 Hours

Max. Marks: 75

Note: Answer **all** questions of Part – A. Answer any **five** questions from Part-B.

PART – A (25 Marks)

1. Mention the alloys of copper. (2)
2. What is meant by super conductivity? (3)
3. What is meant by stacking factor? (2)
4. Define thermal resistance and mention its units. (3)
5. What are the advantages and disadvantages of higher number of poles in case of d.c. machine? (3)
6. Define specific electric loading. (2)
7. What is the condition to design for minimum cost of transformer? (2)
8. How SCR effects on synchronous machine performance? (3)
9. What are the different approaches of computer aided design of electrical machines? (2)
10. How digital computer helps to design the electrical machine? (3)

PART – B (50 Marks)

11.(a) Write short notes of the following material (6)
(i) High-nickel permalloy
(ii) perminvar
(iii) permendur

(b) Explain the fundamental requirements to be met by high conductivity materials. (4)

12.(a) Explain relationship between real and apparent flux densities with necessary equations. (5)

(b) Determine the air gap length of a d.c. machine from the following particulars :
Gross core length of core = 0.12m ;
No. of ducts = 1 and 10 mm wide
Slot pitch = 25 mm ;
Slot width = 10 mm ;
Carters coefficient for slots and ducts = 0. 32
gap density at pole center = 0.7 Wb / m^2
Field mmf per pole = 3900 A
mmf required for iron parts of magnetic circuit = 800A (5)

13. A 400 KVA transformer has its maximum efficiency at 80 percent of full load. During a short full load heat run the temperature rise after one hour and two hours is observed to be 24°C and 34°C, respectively. Find the thermal time constant and final steady temperature rise the transformer.
If, by use of a fan, the cooling in improved so that rate of heat dissipation per unit area per degree rise in temperature is increased by 15%, find new kVA rating possible for the same final temperature rise. (10)

14.(a) Derive output equation of a DC machine from fundamentals. (5)
(b) What are the factors to be considered while selecting number of armature slots in a d.c. machine? (5)

15.(a) Derive the output equation of AC rotating machine. (5)
(b) Explain design of turbo alternators with necessary equations. (5)

16.(a) Derive output equation of a 3-phase transformer from basics. (6)
(b) Write short notes on materials used for rheostats and heating devices. (4)

17. Explain computer aided design of 3-phase induction motor in detail. (10)