A 254

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2005.

Third Semester

Electrical and Electronics Engineering

EE 232 — ELECTRICAL MACHINES — I

Time : Three hours Maximum : 100 marks

Ordinary graph sheet may be provided.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the terms m.m.f and reluctance.

2. What is the method used to reduce the eddy current loss?

3. Define all-day efficiency of a transformer.

4. What is the application of equivalent circuit of a single phase transformer.

5. Give examples for multiply-excited magnetic field systems and explain the term multiply excited systems.

6. With the help of a block diagram explain about electro mechanical energy conversion device.

7. Define the terms pole pitch and commutator pitch.

8. Define the term distribution factor.

9. What are the methods used to decrease the effect of armature reaction?

10. What is a regenerative test? Give an example.

PART B — (5 × 16 = 80 marks)

11. (i) Derive an expression for the magnetic torque developed in a doubly-excited translational magnetic system. (10)

(ii) The self and mutual inductances of the two exciting coils of a multiply-excited translatory system are :

$$L_{11} = L_{22} = \frac{3.6}{1+2x}, \; L_{12} = L_{21} = \frac{1.8}{1+2x}.$$

Calculate the time, average force and coil currents at x = 0.4 m when both the coils are connected in parallel across a voltage source of 100 cos 314 t. (6)

12. (a) (i) Define the terms self inductance and mutual inductance. Derive the expressions for the self and mutual inductances of two coils connected in series. (8)

(ii) When two coils are connected in series, their effective inductance is found to be 10 H. When the connections of one coil are reversed, the effective inductance is 6H. If the coefficient of coupling is 0.6, calculate the self inductance of each coil and the mutual inductance. (8)

Or

(b) (i) Explain the two different types of magnetic circuits with neat diagram. (10)

(ii) The magnetic circuit frame shown in Fig. 1 is built of iron of square cross-section of 3 cm. Each air gap is 2 mm wide and each of the coil is wound with 1000 turns. The relative permeability of par A and B are 1000 and 1200 respectively. Calculate the total reluctance. (6)

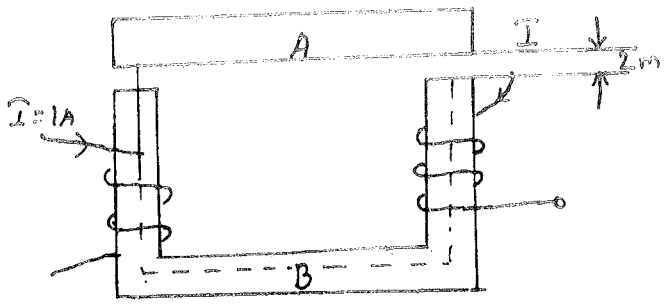

Fig. 1

13. (a) (i) A 15 KVA, 2000/200 V transformer has an iron loss of 250 W and full-load copper loss 350 W. During the day it is loaded as follows :

No. of hours	Load	Power factor
9	$\frac{1}{4}$ load	0.6
7	full load	0.8
6	$\frac{3}{4}$ load	1.0
2	No load	—

Calculate the all-day efficiency. (10)

(ii) Explain the working principle of auto transformer. (6)

Or

(b) Explain in detail about the parallel operation of single phase transformers. (16)

14. (a) (i) Explain the constructional features of synchronous machines. (8)

(ii) Explain the production of torque in synchronous motor. (8)

Or

(b) Explain the mmf of distributed A.C. windings.

15. (a) A shunt generator running at a speed of 1000 rpm gave the following magnetization curve :

EMF., V :	95	179	224	251	272	281
Field Current, A :	1.0	2.0	3.0	4.0	5.0	6.0

If the field circuit resistance is 60 Ω, determine

(i) The voltage to which the machine will build up running at the same speed.

(ii) The value of the field regulating resistance if the machine is to build up to 130 V, when its field coils are grouped into two parallel circuits and generator is run at 500 rpm.

Or

(b) (i) Explain the method speed control of d.c. shunt motor with armature control. (8)

(ii) Draw the circuit of a 2 point starter and explain the principle of operation. (8)
