

**FOURTH SEMESTER B.TECH. (ENGINEERING) DEGREE
EXAMINATION, DECEMBER 2006**

EE 2K 405/PTEE 2K 303—ELECTRICAL MACHINES—I

Time : Three Hours

Maximum : 100 Marks

Answer all questions.

- I. (a) Discuss the MMF in three phase winding.
 (b) Define distribution factor and chording factor.
 (c) What is demagnetising and cross magnetising ampere turns ?
 (d) Derive the expression for EMF equation of DC generator.
 (e) Draw and explain the Terminal characteristics of DC generator.
 (f) List the merits of Hopkinson's test.
 (g) Write short notes on Transformer with losses but no magnetic leakage.
 (h) Write short notes on V-V connection.

(8 × 5 = 40 marks)

- II. (a) Draw the winding diagram in developed form for a simplex lap wound 24 slots 4 pole d.c. armature with 24 commutator segments.

(15 marks)

Or

- (b) Write short notes on :

- (i) EMF generated in a conductor. (7 marks)
 (ii) MMF distribution in d.c. machines. (8 marks)

- III. (a) (i) Explain with neat sketch the process of commutation in DC generator. (8 marks)

- (ii) Derive the expression for Reactance voltage :

- 1 if the commutation is linear ;
 2 if the commutation is sinusoidal.

(7 marks)

Or

- (b) (i) Derive the expression for Demagnetising AT/Pole. (7 marks)

- (ii) A 4 pole wavewound motor armature has 880 conductors and delivers 120 A. The brushes have been displaced through 3 angular degrees of freedom from the geometrical axis.
 (a) Cross magnetising AT/Pole (b) The additional field current for neutralizing the demagnetisation of the field windings has 1100 turns/pole.

(8 marks)

Turn over

- IV. (a) (i) Discuss the application of DC generators. (5 marks)
- (ii) A shunt generator delivers 195 A at terminal voltage of 250 V. The armature resistance and the shunt field resistance are 0.02Ω and 50Ω respectively. The iron and friction losses equal 950 W. Find :
- 1 EMF generated.
 - 2 CU losses.
 - 3 Output of the prime motor.
 - 4 Commercial, mechanical and electrical efficiencies.

(10 marks)

Or

- (b) (i) Describe briefly the methods of speed control available for DC motors. (7 marks)
- (ii) A 250 V d.c. shunt motor has shunt field resistance of 250Ω and an armature resistance of 0.25Ω . For a given load torque and no additional resistance included in the shunt field circuit, the motor runs at 1,500 r.p.m. drawing an armature current of 20 A. If a resistance of 250Ω is inserted in series with the field, the load torque remaining the same, find out the new speed and armature current. Assume the magnetisation curve to be linear.

(8 marks)

- V. (a) (i) From the phasor diagram, develop the equivalent circuit of the transformer. (7 marks)
- (ii) A 1ϕ transformer has 1000 turns on the primary 200 turns on the secondary, the no load current is 3A at a power factor of 0.2 lagging. Calculate the primary current and power factor when secondary current is 280 A at a power factor of 0.8 lagging.

(8 marks)

Or

- (b) (i) Draw a circuit diagram and explain the procedure for conducting OC and SC tests. (10 marks)
- (ii) A 300 kVA 1ϕ transformer is designed to have a resistance of 1.5 % and maximum efficiency occurs at a load of 173.2 kVA. Find its efficiency when supplying full load at 0.8 p.f. lagging at normal voltage and frequency.

(5 marks)

[4 × 15 = 60 marks]