

**D 23524**

(Pages : 2)

Name.....

Reg. No.....

**THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE  
EXAMINATION, DECEMBER 2011**

**EC 04 304—ELECTRICAL ENGINEERING**



Time : Three Hours

Maximum : 100 Marks

*Answer all questions.*

- I. (a) Explain the load characteristics of a DC shunt generator.  
(b) A DC motor is said to be a self regulating machine. Justify.  
(c) What is meant by regulation of a transformer ? Derive the condition for zero voltage regulation.  
(d) Derive the condition for maximum efficiency of a transformer.  
(e) Describe the various measures taken for the suppression of harmonics on alternators.  
(f) Explain synchronous condensers and their applications.  
(g) Differentiate between indicating instrument and integrating instruments, with examples.  
(h) Explain the working of Schering bridge.

(8 × 5 = 40 marks)

- II. (a) (i) Explain the commutation process in DC machine. How it can be improved ? (8 marks)  
(ii) A 23.75 kW, 250 V lap wound DC shunt generator has 50 slots with 8 conductors per slot and shunt field resistance of 50 Ω. The brushes are given a load of 8° (mechanical) when the generator delivers full-load current. Calculate the number of turns on the compensating winding if the pole arc to pole pitch ratio is 0.8.

(7 marks)

*Or*

- (b) (i) Explain the various methods for the speed control of DC motors. (8 marks)  
(ii) A DC series motor runs at 1000 r.p.m. and takes 25 A from 250 V mains. The armature current is then reduced to 15 A by inserting a series resistance. Find the new speed and the value of the resistance inserted if the load torque varies as the square of the speed and the field flux is reduced by 15 % for the above changes in armature current. Assume the combined resistance of the armature and the series field to be 1.0 Ω.

(7 marks)

3. (a) (i) What are the various losses occurring in a transformer ? How they can be minimised ? (6 marks)  
(ii) A 200 kVA transformer has an efficiency of 98 % at full-load. If maximum efficiency occurs at three quarters of full-load, calculate the efficiency at half load. Assume negligible magnetising current and pf of 0.8 at all loads.

(9 marks)

*Or*

**Turn over**

- (b) (i) Explain how the equivalent circuit parameters are determined for a transformer. (8 marks)
- (ii) The primary of a transformer is rated at 10 A and 1000 V. On open circuit, the readings are  $V_1 = 1000$  V,  $V_2 = 500$  V,  $I = 0.42$  A and power  $P = 100$  W. Draw an equivalent circuit for the transformer and determine the parameters. (7 marks)
4. (a) (i) What is meant by voltage regulation in an alternator? (3 marks)
- (ii) A 3-phase, star connected 1000 kVA, 11000 V, alternator has rated current of 52.5 A. The AC resistance of the winding per phase is  $0.45 \Omega$ . The test results are given below :
- OC Test : Field current = 12.5 A, Voltage between lines = 422 V
- SC Test : Field current = 12.5 A, Line current = 52.5 A.
- Determine the full-load voltage regulation of the alternator (1) at 0.8 p.f. lag ; (2) 0.8 p.f. lead. (12 marks)

*Or*

- (b) (i) Explain the principle of operation of a 3-phase induction motor. (5 marks)
- (ii) With a neat sketch, explain the torque-slip characteristics of an induction motor. Also indicate the starting torque, pull out torque and operating region in the figure. (10 marks)
5. (a) Explain the working principle of dynamometer type watt meter, with supporting sketches. Explain its advantages and disadvantages.

*Or*

- (b) Write short notes on :
- (i) DC slide wire potentiometer.
  - (ii) Absolute and secondary instruments.
  - (iii) Kelvin's double bridge.

(4 × 15 = 60 marks)