

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-1 EXAMINATION-2015
B.Tech (ECE, CE) III Semester

COURSE CODE: 10B11EC311

MAX. MARKS: 15

COURSE NAME: ELECTRICAL MACHINES AND INSTRUMENTS

COURSE CREDITS: 4

MAX. TIME: 1 HR

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

- Q1. (a) Explain the magnetic leakage and fringing effect in a magnetic circuit. [1.5]
(b) An air-cored toroidal coil has 3000 turns and carries a current of 0.1 A. The cross-sectional area of the coil is 4 cm^2 and the mean length of the magnetic circuit is 15 cm. Find the magnetic field strength, the flux density and the total flux within the coil. [1.5]
- Q2. (a) How the size of the transformer depends upon the supply frequency, explain. [1]
(b) A single phase, 230 V/ 110 V, transformer has iron loss of 100 W at 60 Hz. Determine the hysteresis and eddy-current losses at 50 Hz. [2]
- Q3. (a) Draw the equivalent circuit and phasor diagram of a practical transformer on (i) inductive load, and (ii) capacitive load. Assume zero copper loss and no leakage of flux. [2]
(b) Derive the condition for maximum voltage regulation for a transformer. [1]
- Q4. (a) What do you mean by the armature reaction in a DC machine? [1]
(b) Derive the condition for maximum efficiency of a DC generator. [1]
(c) A 6-pole, dc motor takes an armature current of 110 A at 480 V. The resistance of the armature circuit is 0.2Ω , and flux per pole is 50 mWb. The armature has 864 lap-connected conductors. Calculate (i) the speed, and (ii) the gross torque developed by the armature. [1]
- Q5. (a) Define critical speed and critical field resistance for a DC generator. [1]
(b) A 4-pole shunt generator with lap-wound armature has armature and field resistances of 0.5Ω and 60Ω , respectively. It supplies power to 110 lamps, each of 50 W, 200 V. Calculate the armature current and the generated emf. [1]
(c) In core type transformer, why the low voltage winding is kept closer to the magnetic core. [1]