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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- Oct 2017

B.Tech III Semester

COURSE CODE: 10B11EC311 MAX. MARKS: 25

COURSE NAME: Electrical Machines and Instruments

COURSE CREDITS: 04 MAX. TIME: 1.5hr.

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

Q1 a) Explain why the iron losses occur in the core of a transformer? How to minimize these losses? (3)

b) Explain the torque characteristics of various DC motors. (2)

Q2 a) A 220-V, dc shunt motor takes a full-load current of 32 A while running at 850 rpm. It has an armature resistance of 0.5 Ω and shunt field resistance of 110 Ω. Calculate the speed at which the machine runs, if (*i*) a 1.5-Ω resistor were introduced in series with the armature, (*ii*) a 30-Ω resistor were connected in series with the field winding. Assume that the torque remains constant throughout and the field flux is proportional to the field current. (4)

b) Explain the effect of change of excitation of a synchronous motor on (i) its armature current and (ii) its power factor. (4)

Q3 a) A 3-phase, 50-Hz, 20-pole, salient-pole alternator with star-connected stator winding has 180 slots on the stator. There are 8 conductors per slot and the coils are full-pitch. The flux per pole is 25 mWb. Assuming sinusoidally distributed flux, calculate (i) the speed, (*ii*) the generated emf per phase, and (iii) the line emf. (3)

b) Explain the working principle of a three-phase induction motor. Also describe the constructional differences between a squirrel cage rotor and wound rotor of an induction motor. (4)

Q4 a) Prove that in induction motor, $\dfrac{\tau_{st}}{\tau_m} = \dfrac{2s_m}{s_m^2+1}$, where τ_{st} is starting torque, τ_m is maximum torque, and s_m is slip value at maximum torque. (3)

b) How does induction motor differs from synchronous motor? (2)