Dr. Pradeep Kumar
ECE

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
SUMMER SEMESTER EXAMINATION- JULY 2016
III[rd] SEMESTER

COURSE CODE: 10B11EC311 MAX. MARKS: 50
COURSE NAME: Electrical Machines and Instruments MAX. TIME: 2 HRS

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

Q1. a) Can slip of induction motor have negative value? If yes, then what is the condition for that? Explain power flow diagram and power flow equations for an induction motor. [5]

b) Explain torque-slip characteristics curve of induction motor and its various action modes. [5]

Q2. a) A three-phase induction motor is wound for four poles and is supplied from a 50-Hz supply. Calculate (i) The synchronous speed, (ii) The speed of the rotor when the slip is 5%, and (iii) The rotor frequency when the speed of the rotor is 700rpm. [5]

b) Explain construction of a DC machine and find its EMF equation. [5]

Q3. a) Explain open circuit and load characteristics of DC generators. [5]

b) A shunt generator gives full-load output of 20kW at a terminal voltage of 200V. The armature and shunt-field resistances are 0.07Ω and 50Ω, respectively. The iron and friction losses are 1000W. Calculate (i) the emf generated (ii) the copper losses, and (iii) the efficiency. [5]

Q4. a) What is stepper motor? In which way one phase ON mode, two phase ON mode and half step operations are differentiated from each other in variable reluctance stepper motor? [5]

b) A 230 V, 50 Hz, split phase induction motor has main winding resistance of 5Ω and inductive reactance of 12Ω, and starting (auxiliary) -winding resistance of 10Ω and inductive reactance of 6Ω. Determine at the start (i) the current in the main winding (ii) the current in the auxiliary (starting) winding (iii) the line current (iv) the phase displacement between the two winding currents, and (v) the power factor. [5]

Q5. a) Explain working of LVDT transducer. [5]

b) One junction of an iron-copper thermocouple is maintained at 300 °C and the other at 0 °C. Calculate the thermo emf generated. The thermoelectric constants are given as [5]

$x_1 = 13.42\ \mu V\,°C^{-1}$ and $x_2 = -0.029\ \mu V\,°C^{-2}$