Registration No. : | | | | | | | | | | |

Total number of printed pages – 3

B. Tech

PEEL 5303

Sixth Semester Examination – 2013

ELECTRIC DRIVE

BRANCH : EEE / ELECT.

QUESTION CODE : A235

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

(a) What is steady state stability of electrical drives ?

(b) What are the differences between active and passive load torques ?

(c) In a separately excited d.c. motor running at certain speed, if supply voltage is reduced to 50%, what will be the effect on its steady state speed ?

(d) Half hour rating of a motor is 100 kW. Heating time constant is 30 minute and the maximum efficiency occurs at 70 % of full-load. What is the continuous rating of the motor ?

(e) Variable frequency control of induction motor yields high torque to current ratio during starting. Why ?

(f) Why is it necessary to maintain constant terminal voltage for variable frequency variable voltage control of induction motor drive above base speed ?

(g) Why is CSI fed induction motor operated at constant rated flux ?

(h) Why the traction drive should have large torque at low speeds and when just being started ?

P.T.O.

(i) What are the limitations of stator voltage control method of speed control for three-phase induction motor ?

(j) Why a train driven by separately excited d.c. motors has better adhesion than a train driven by series d.c. motors ?

2. (a) Explain the operation of a closed-loop position control scheme. What are the roles inner speed control and current control loops ? 5

(b) The 10 minute rating of a domestic mixer motor is 200 Watts. The heating time constant is 40 minutes and the maximum efficiency occurs at full load (continuous). Determine the continuous rating. 5

3. (a) Explain with neat circuit diagram, the regenerative braking of separately excited d.c. motor using a single-phase fully controlled rectifier. 5

(b) A 220 V, 960 rpm, 12.8 A separately excited d.c. motor has armature circuit resistance and inductance of 2 Ohm and 150 mH respectively. It is fed from a single-phase half-controlled rectifier with an a.c. source voltage of 230 V, 50 Hz. Calculate motor torque for $\alpha = 60^{\circ}$ and speed = 600 rpm. 5

4. (a) What are the advantages of static rotor resistance control over conventional method of rotor resistance control ? 5

(b) When started on no-load, a salient pole synchronous motor pulls into synchronism even before d.c. excitation is applied, why ? 5

5. (a) How the speed and power factor of a wound rotor induction motor are controlled by injecting a voltage in the rotor circuit ? 5

(b) A 440 V , 50 Hz, 4 pole, 1420 rpm, delta connected squirrel cage induction motor has the following parameters :

$R_s = 0.35\ \Omega$, $Rr' = 0.4\ \Omega$, $X_s = 0.7\ \Omega$, $X_r' = 0.8\ \Omega$

The motor is fed from a voltage source inverter. The drive is operated with a constant (V/f) control up to 50 Hz and at rated voltage above 50 Hz. Calculate the breakdown torques for a frequency of 75 Hz both for motoring and braking operations. 5

6. (a) Explain 25 kV a.c. traction drive employing thyristor converter controlled d.c. motors. Why a converter with sequence control is employed ? 5

(b) A 80 tonne motor coach is driven by 4 motors, each developing a torque of 2500 N-m during acceleration. If up-gradient is 20 in1000, gear ratio 0.25, gear transmission efficiency of 95%, wheel radius 0.5 M, train resistance 25 N/tonne, effective mass on account of rotational inertia is 10% higher, calculate the time taken to attain a speed of 100 kmph. 5

7. (a) Explain various functionalities of microprocessor in Drive Technology with relevant block diagram. 5

(b) Give the drive consideration for the steel rolling mills. 5

8. Answer any **two** of the following : 5×2

(a) Load equalization

(b) Current regulated Voltage Source Inverter Control of Induction Motor.

(c) DC Traction using polyphase a.c. motors

(d) Drives for Cement Mill.