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

Total Number of Pages : 02 **B.Tech.**
PEEL5303

6th Semester Back Examination 2017-18
ELECTRIC DRIVES
BRANCH : ELECTRICAL
Time : 3 Hours
Max Marks : 70
Q.CODE : C575

Answer Question No.1 which is compulsory and any Five from the rest.
The figures in the right hand margin indicate marks.
Attempt all parts of a question at a place

Q1. **Answer the following questions :** **(2 x 10)**

a) Draw the block diagram of an electric drive.
b) How experimentally moment of inertia of a motor is determined?
c) Why the slip power recovery scheme is suitable mainly for drives with low speed range?
d) What are the roles of inner current control loop?
e) Half hour rating of a motor is 100KW.Heating time constant 80 minute and the maximum efficiency occurs at 70% of full load. What is the over loading factor?
f) What is counter-torque braking?
g) Why variable frequency control in Induction motor below the rated frequency is carried out at rated air gap flux by maintaining (V/f) ratio constant at the rated value?
h) On which factors coefficient of adhesion depends?
i) What are the advantages of static rotor resistance control?
j) What is true synchronous mode of control in synchronous motor?

Q2. **a)** Explain what do you understand by the steady-state stability? What is the main assumption? **(5)**

b) The heating and cooling time constants of an electric motor are 100 and 150 minutes respectively. The rating of the motor is 125KW. If it is working on duty cycle of 15 minutes on load and 30 minutes on no-load determine the permissible overloading of the motor. Assume the losses are $Pc + k^2 P_{cu}$ and ${P_c}/{P_{cu}} = \alpha = 0.4$. **(5)**

Q3. **a)** Explain the operation of a Phase-Locked-Loop (PLL) control. **(5)**

b) A 400 volt, 750 rpm, 70 amp dc shunt motor has an armature resistance of 0.3 ohm. When running under rated conditions, the motor is to be braked by plugging with the armature current limited to 90 amp. What external resistance should be connected in series with the armature? Calculate the initial braking torque and its value when the speed has fallen to 300 rpm. Neglect saturation. **(5)**

Q4. **(a)** Describe relative merits and demerits of four quadrant dc drives employing non-circulating and circulating current dual converters. **(5)**

(b) A 220 V, 750 rpm, 200A separately excited motor has an armature resistance of 0.05 ohm. Armature is fed from a three phase non-circulating current dual converter consisting of fully controlled rectifiers A and B. Rectifier A provides motoring operation in the forward direction and rectifier B in reverse direction. Line voltage of ac source is 400 V. Calculate firing angles of rectifiers for the following assuming continuous conduction : **(5)**

(i) Motoring operation at rated torque and 600 rpm
(ii) Regenerative braking operation at rated torque and 600 rpm

Q5. a) What are the drawbacks of rectified-fed dc drives? **(5)**

b) A 230 V, 1200 rpm, 15 A, separately excited motor has an armature resistance of 1.2 ohm. Motor is operated under dynamic braking with chopper control. Braking resistance has a value of 20 ohm. **(5)**

(i) Calculate duty ratio of chopper of motor speed of 1000 rpm and braking torque equal to 1.5 times rated motor torque.
(ii) What will be the motor speed for duty ratio of 0.5 and motor torque equal to its rated torque?

Q6. a) Draw and Explain Speed control of Induction motor by stator voltage control and mention its advantages & disadvantages. **(5)**

b) A 3-phase, delta connected, 6 pole, 50 Hz,400 V, 925 rpm squirrel-cage induction motor has the following parameters: **(5)**
R_s= 0.2 ohm, R_r'= 0.3 ohm, X_s = 0.5 ohm, X_r'= 1 ohm
The motor is fed from a voltage source inverter with a constant V/f ratio from 0 to 50 Hz and constant voltage of 400 V above 50 Hz frequency.

(i) Determine the breakdown torque for a frequency of 100 Hz as a ratio of its value at 50 Hz.
(ii) Calculate the motor torque at 30 Hz and a slip speed of 60 rpm.

Q7. a) Explain the advantages and limitations of the 25 KV, 50 Hz ac traction using on-load transformer tap changer. **(5)**

b) A local train uses motor and trailer coaches in the ratio of 1:2. The weight of a motor coach is 40 tonnes and that of trailer 35 tonnes. All the wheels in the motor coach are driving wheels. The train resistance is 30 N/tonne. Effective rotating mass is 10% of the dead weight. If the coefficient of adhesion is 0.3, calculate (a) The maximum train acceleration on a level track. (b) What will be maximum acceleration if the motor and trailer coaches are used in the ratio of 1:1? **(5)**

Q8. Write short Notes on any TWO of the following : **(5 x 2)**

a) Drives in Cement Mill
b) Plugging of separately excited D.C. motor
c) Short time duty of motor
d) Control of D.C. drive using Microprocessor