CODE NO:- Z-262

FACULTY OF ENGINEERING & TECHNOLOGY
B.E (EEP/EE/EEE) Year Examination - June – 2015
Electric Drives
(Revised)

[Time: Three *Hours*]   [Max. Marks:80]

"Please check whether you have got the right question paper."
    i) Q. No.1 and Q.No.6 are compulsory.
    ii) Solve <u>any two</u> questions from Q-2 to Q-5 and Q-7 to Q-10.
    iii) Assume suitable data wherever necessary.

SECTION-A

Q.1 a) State essential parts of electrical drives .What are the functions of each part?   05
     b) Explain in detail a four quadrant operation of a motor driving hoist load.   05

Q.2 a) Why current sensing is required in electrical drives ?what are the common method of current sensing?   07
     b) A drive has the following parameters :T=150-0.1N ,N-mt,Where N is speed in rpm load torque t_c=100N-mt   08
       Initially the drive is operating in steady state . The characterisitics of the load torque are changed to T_L=-100N-mt
       Calculate initial & final equilibrium speeds.

Q.3 a) What are the different methods of speed control normally employed for d.c.motors ? Hence ,sketch the   07
       charaterestics of a seperately excited d.c motor based on these methods .Indicate clearly constant –torque and
       constant power drive regions .
     b) A seperately excited d.c motor Ts supplied from 250v,50Hz source through a single phase half wave converter.   08
       Its field is fed through 1-phase semiconverter with zero degree firing angle delay. Motor resistance r_a =0.7Ω and
       motor constant =0.5V-se/rad. For rated load torque of 15N-mt at 1100rpm & for continuous ripple free currents
       ,determine
          a) Firing angle delay of the armature converter .
          b) RMS value of thyristor and free wheeling diode currents .

Q.4 a) Describe how the speed of a d.c series motor can be controlled by means of a d.c chopper.   07
     b) A d.c series motor , fed from 415v d.c source through a chopper , has the following parameters :   08
       r_a =0.055Ω, $r_s = 0.075Ω$, $k = 5.2 \times 10^{-3} Nm/Amp^2$. The average armature current of 210A is ripple free .for
       a chopper duty cycle of 50% Determine   i) motor torque   ii) speed of the motor.

Q.5 Write short notes on the following   15
        a) Load equalization .
        b) Regenerative braking .
        c) Industrial applications of d.c motor .

SECTION-B

Q.6 a) Explain in detail current source inverter fed induction motor drive . why CSI fed I.M drive is operated at a   10
       constant rated flux ?
     b) Explain static kramer drive.why has the static kramer drive is used for low range of speed control?

Q.7 a) In a stator frequency control of a 3-phase induction motor , explain why   07
         i) Ratio V/f is maintained constant for speed below base speed.
         ii) Terminal voltage is maintained constant for speeds above base speed.
     b) A 2.85kw ,415v ,50Hz ,4 pole , 1370rpm ,delta connected squirrel cage induction motor has following   08
       parameters referred to the stator , $r_1 = 2.1Ω$, $r_2 = 5.5Ω$, $x_1 = x_2 = 5.5Ω$, $x_m = 82Ω$ .motor speed is controlled
       by stator voltage control when driving a fan load it runs at rated speed at rated voltage .calculate ,
         i) Motor terminal voltage , current x torque at 1250 rpm &
         ii) Motor speed , current & torque for the terminal voltage of 325v.

Q.8   a)   Explain in detail true synchronous mode and self control mode for variable frequency control of synhconous   07
             motor
       b)   A 20kw ,3 phase ,440v,4 pole ,data connected permanent magnet synchronous motor has following parameters   08
             ;$x_s = 5\Omega$, $R_S = 0\Omega$, $rated\ p.f = 1.0$ machine is controlled by variable frequency control at a constant (v/f)
             ratio. Calculate , Armature current , torque angle , and power factor at half full load troque and 750 rpm.

Q.9   a)   Explain in detail , why the load coommutated inverter fed synchronous motor drive is found suitable for high   07
             power applications
       b)   Deseribe the operation of brushless d.c motor drive. State it's advantage over a low cost three phase brushless d.c   08
             motor drive

Q.10   Write short note on the following :   15
             a)   PWM controlled induction motor drive .
             b)   Industrial application of A.C Drives.
             c)   Brushless d.c. motor drives for servo applications