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# Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
## Industrial Drives and Applications

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　　　　　Max. Marks:100

**Note:** *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

## PART – A

1   a. With the help of suitable speed torque convention and diagram, explain four quadrant operation of a motor driving a hoist load. **(10 Marks)**

　　b. A motor drives two words. The rotational load coupled to the motor through reduction gear with a = 0.1 and efficiency of 90%. The load has a moment of inertia of $10kg - m^2$ and a torque of 10 N-m. Other load has a translational motion and consists of 1000 kg weight to be lifted up at a uniform speed of 1.5m/sec. The coupling between this load and motor has an efficiency of 85%. Motor has an inertia of $0.2 kg/m^2$ and runs at a constant speed of 1420 rpm. Calculate the equivalent moment of inertia and torque referred to the motor shaft and power developed by the motor. **(10 Marks)**

2   a. Derive the expression to determine the power ratings of electric motors for continuous duty for fluctuating and intermittent loads by Equivalent current, Torque and Power methods. **(12 Marks)**

　　b. The 10 minute rating of a motor used in a domestic mixer is 200 watts. If the heating time constant is 40 minute, calculate the continuous rating. Assume that the maximum efficiency of motor occur at full load. **(08 Marks)**

3   a. With circuit diagram and waveforms , explain half controlled rectifier control of separately excited motor for continuous conduction mode. **(10 Marks)**

　　b. A 220V, 1500 rpm, 10A separately excited dc motor is fed from a single phase fully controlled rectifier with an ac source voltage of 230V, 50Hz , $R_a = 2\Omega$. Conduction can be assumed to be continuous. Calculate the firing angles for
　　　i)   Half the rated motor torque and 500 rpm.
　　　ii)  Rated motor torque and -1000 rpm. **(10 Marks)**

4   a. With circuit diagram and wave forms, explain three phase fully controlled rectifier control of separately excited d.c. motor. **(10 Marks)**

　　b. A 230V, 1000 rpm and 15A separately excited d.c motor has an armature resistance of $1.2\Omega$. Motor is operated under dynamic braking with chopper control with a braking resistance of $20\Omega$. Calculate  i)   the duty ratio of chopper for a motor speed of 1000 rpm and braking torque equal to 1.5 times the rated motor torque.
　　　ii)  the motor speed for a duty ratio of 0.5 and motor torque equal to its rated torque. **(10 Marks)**

## PART – B

5   a. Explain the operation of a three phase induction motor operating with unbalanced source voltages and single phasing. **(10 Marks)**

　　b. A 3 phase, 440V, 50Hz , 6 pole star connected induction motor has following parameters referred to the stator. $R_s = 0.5\Omega$ , $R_r' = 0.6 \Omega$ , $X_s = X_r' = 1\Omega$. Stator to rotor turns ratio is 2. If the motor is used for the regenerative braking, calculate  i)   the maximum overhauling torque it can hold    ii)   the range of speed in which it can safely operate. **(10 Marks)**

**6** a. With circuit diagram and waveforms, explain the operation of current source inverter fed induction motor drive. **(10 Marks)**

b. With circuit diagram and rotor current wave form, explain the speed control of three phase induction motor by static rotor resistance control. **(10 Marks)**

**7** a. With circuit diagram, explain the self controlled synchronous motor drive employing load commutated thyristor inverter. **(10 Marks)**

b. Explain why the load commutated inverter fed synchronous motor drive is found suitable for high speed and high power application. **(10 Marks)**

**8** a. Explain briefly the process involved in a cement factory. And also explain the different types of drives employed. **(10 Marks)**

b. Explain briefly the different process involved in a textile industry. And also explain the different types of drives employed. **(10 Marks)**

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