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**COLLEGE OF ENGINEERING PUNE-5.**  
(Formerly Government College of Engineering, Pune-411005).

**End Semester Examination**  
**EE317- INDUSTRIAL DRIVES**

Programme: T.Y.B.Tech. (All Branches)  
Year: 2012-13 (Second Semester)  
Duration: 3 Hours.

Date: 23/04/2013  
Max. Marks: 50

- Instructions:** (i) Solve all the questions. Each question carries equal marks.  
(ii) A figure to the right bracket indicates full marks.  
(iii) Use of electronic calculator is allowed.  
(iv) Draw neat figures and assume necessary data wherever required.
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**Q.1.**

- (a) Draw the typical torque-speed characteristics of induction motor at rated supply conditions, showing four quadrant operations. With a hoist load show the speed, shaft torque and load torque conventions in four quadrants. (5)
- (b) (i) List various methods for calculating motor rating for variable load drives. (2)  
(ii) Determine the rated current of a motor for following duty cycle:  
500 A for 3 minutes;  
A sharp increase 1000 A and constant at this value for a minute;  
Gradually decreasing for 2 minutes to 200 A and constant at this value for 2 minutes;  
Gradually increasing to 500 A during 2 minutes and the repetition of the cycle. (3)

**Q.2.**

- (a) Draw the torque-speed and torque-armature current characteristics for commonly used dc motors. With proper applications discuss importance of these characteristics while selecting a motor for desired application. (5)
- (b) A 440 V shunt motor while running at 1500 rpm takes an armature current of 30 A and delivers an output of 15 hp, the load torque varies as the square of the speed. Calculate the value of resistance to be connected in series with armature for reducing the motor speed to 1300 rpm. (5)

**Q.3.**

- (a) (i) The power input to a 500 V, 50 Hz, 6 pole, 3 phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and the friction and windage losses total 2 kW. Calculate- (i) the slip, (ii) the rotor copper loss, (iii) shaft power, (iv) the efficiency (4)  
(ii) Also show the power flow diagram within the induction motor. (1)

**OR**

- (a) A 6 pole, 50 Hz, 3-phase induction motor running on full load develops a useful torque of 160 N-m when the rotor emf makes 120 complete cycles per minute. Calculate the shaft power output. If the mechanical torque lost in friction and that for core loss is 10 N-m, Compute—(i) the copper loss in the rotor windings; (ii) the input to the motor; and (iii) the efficiency. The total stator loss is given to be 800 W. (5)
- (b) Draw the closed loop control scheme of static Scherbius drive and explain its operation. State its merits, demerits and limitations. (5)

**Q.4.**

- (a) Discuss the upcoming developments in synchronous motors and explain how they are competing with dc and induction motors in variable speed applications. (5)

(b) Draw the schematic for current regulated VSI fed BLDC motor drive and explain its operation with suitable diagrams. (5)

**OR**

(b) Draw the schematic for current regulated VSI fed sinusoidal PMAC motor drive for servo application and explain its operation with suitable diagrams. (5)

**Q.5.**

(a) List advantages of electric vehicles (EV) over the internal combustion vehicles (ICV). Draw the scheme for permanent magnet dc motor drive for battery operated vehicles. Explain motoring and regenerative braking operation.

**OR**

(a) Explain the operation of solar pump drive using induction motor with suitable diagrams. (5)

(b) Write a short note on---

(i) Drives for robotics

(ii) Drives for CNCs

(5)

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