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EE/T/414/2017 (S)

Bachelor of Electrical Engineering, 2017

(4th Year, 1st Semester, Supplementary)

ELECTRIC DRIVES

Time: Three Hours

Full Marks: 100

(50 marks for each part)

Use a separate Answer-Script for each Part

PART - I

Answer *any three* questions from this part.

Two marks are reserved for neat and well organised answer.

1. a) What factors are to be considered for the selection of electric drive? Discuss in brief. 4
b) What is four quadrant operation? Explain your answer with suitable example. 8
c) For falling speed-torque characteristic of a load it will run stably only when that of motor is less rising --- Correct and / or justify. 4
2. a) Classify motors used in drive system according to the required type of duties. Draw the load-time, loss-time and the temperature rise - time curves in the case of S5 and S6 type of duties. 8
b) Find out an expression for Temperature Rise of an electric motor with intermittent duty cycle. 8
3. a) Draw and explain connection diagram of a DC shunt motor starter using back emf sensing relay. 8
b) Draw connection diagram of DOL starter for starting a three phase induction motor with the provision for speed reversal and overload protection. 8

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4. a) Derive expressions for speed and current of a DC shunt motor during starting. 8
- b) Derive expression for speed and current of a DC shunt motor during counter current braking. Also draw the variation of speed and current with time. 8
5. a) Draw the time-speed curve for short run and derive an expression for maximum speed of an electric train. 6
- b) Define Co-efficient of adhesion. Co-efficient of adhesion is higher for electric train than for steam train. --- Explain. 4
- c) What are different types of current collector systems used in electric traction? Discuss their advantages and disadvantages, if any. 6

B. ELE. ENGG IV YEAR 1ST SEMESTER SUPPLE EXAMINATION, 2017
(1st / 2nd Semester/Repeat/Supplementary/Annual/Bi-Annual)

SUBJECT: - ELECTRIC DRIVES

Time: Two hours/Three hours/ Four hours/ Six hours

Full Marks 100
(50 marks for each part)

Use a separate Answer-Script for each part

No. of Questions	PART II	Marks
	<p>Answer any Three Questions Two marks are for neat and systematic answers</p>	
Q1. (a)	Explain with suitable diagrams the constant torque and constant power operation of electric drive system.	8
(b)	A 1.1 kW, 1000 rpm, 110V dc separately excited motor is operated at rated load from dc-dc chopper with an input dc voltage of 230V. Find the operating duty ratio of the chopper and the new duty ratio if the speed is to be reduced to half at full load. Assume $r_a=0.6$ ohm.	8
Q2. (a)	Discuss the four quadrant operation of a dc separately excited motor. Use simple sketches wherever necessary.	8
(b)	Explain briefly with block diagrams the speed control schemes of dc separately excited motor with speed and current feedback.	8
Q3. (a)	Explain with suitable block diagram the constant air-gap flux technique of a three phase induction motor. Also explain the nature of torque-speed curves under such operation.	8
(b)	Explain with suitable block diagram the V/f control technique for a squirrel cage induction machine. Also explain the nature of torque-speed curves under such operation.	8
Q4.(a)	A 1.0 kW, 415V, 3-ph, 50Hz, 1440 rpm induction motor is to be operated under linear V/f control scheme. Determine the frequency and voltage references for the motor for constant slip operation if the desired motor speeds are (i) 850rpm (ii) 200 rpm and (iii) 1850 rpm	8
(b)	Describe with necessary diagrams the different current and speed monitoring schemes in an ac drive system.	8
Q5.	<p>Write short notes on any two:</p> <p>(i) DC drive system without speed feedback..</p> <p>(ii) Principle of field oriented control for three phase induction machines</p> <p>(iii) Effect of harmonics on performance and operation of induction machines.</p>	8X2