BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

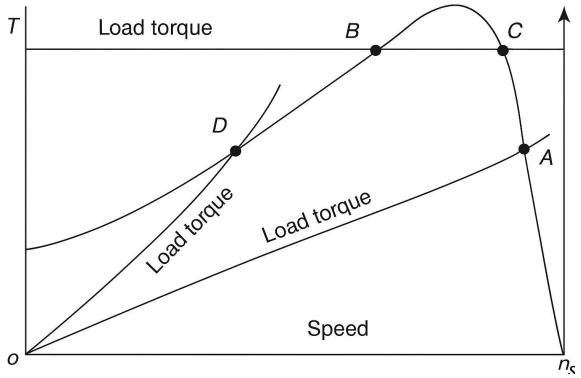
CLASS: BTECH **SEMESTER : VII**
BRANCH: EEE **SESSION : MO/2025**

SUBJECT: EE437 INDUSTRIAL DRIVES AND CONTROL

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	In an electric derive systems, enumerate the functions of power modulator.	[5]	1	1
Q.1(b)	The below figure shows the speed-torque curve and load torques. Discuss on the stabilty of the operating points A, B, C and D.	[5]	1	3



Q.2(a)	Explain how a closed-loop speed control scheme with an inner current control loop operates, and describe the purpose of the inner current control loop.	[5]	2	2
Q.2(b)	A motor operates on a periodic duty cycle in which it is clutched to its load for 10 min and declutched to run on no-load for 20 min. Minimum temperature rise is 40°C. Heating and cooling time constants are equal and have a value of 60 min. When load is declutched continuously the temperature rise is 15°C. Determine i. maximum temperature during the duty cycle, and ii. temperature when the load is clutched continuously	[5]	2	3
Q.3(a)	Derive the expressions for the minimum and maximum braking speeds for obtaining regenerative braking of the dc motor.	[5]	3	3
Q.3(b)	A dc series motor is fed from 600 V dc source through a chopper. The dc motor has the following parameters: r_a = 0.04 Ω, r_s = 0.06 Ω, k=4×10^{-3} Nm/amp^2. The average armature current of 300 A is ripple free. For chopper duty cycle of 60%, calculate: (i) input power from the source, (ii) the equivalent input resistance of chopper drive, (iii) motor speed, (iv) motor torque and (v) draw the circuit diagram.	[5]	3	3
Q.4(a)	Explain the different methods of braking of an induction motor.	[5]	4	4
Q.4(b)	Explain the working principle of open loop V/f control of induction motor with the help of a suitable block diagram.	[5]	4	4
Q.5(a)	Develop a control scheme for variable frequency control of multiple synchronous motors.	[5]	5	5
Q.5(b)	Recommend a control strategy of a Brushless DC motor drive with relevant waveforms.	[5]	5	6

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