

**BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) EXAMINATION, 2024**

(4<sup>th</sup> Year, 2<sup>nd</sup> Semester)

**ELECTRIC DRIVES**

Time : Three hours

Full Marks : 100

(50 marks for each part)

(Use separate Answer Script for each part)

**PART – I**

Answer any three questions.

Two marks are for well-organized answer.

1. (a) Classify electric drives according to their method of speed control. State and discuss their main features. 8
- (b) 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
2. (a) Draw and explain connection diagram of an automatic DC shunt motor starter using Back emf 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
3. (a) What are different Methods available for the determination of Motor rating for Variable Load Drives? Discuss in brief. 8
- (b) Find out an expression for Temperature Rise of an electric machine with Intermittent Short Time ratings. 8
4. (a) Derive an expression for speed and current of a DC shunt motor during starting. 8
- (b) Derive an 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. 8
- (b) What are different types of current collector systems are used in electric traction? Discuss their advantages and disadvantages. 8

**B.E.(ELECTRICAL ENGINEERING)FOURTH  
YEAR SECOND SEMESTER EXAM 2024  
ELECTRICAL DRIVES**

**Time:** Three Hours

**PART - II**

**Full Marks:** 100

( 50 marks for each part)

Use a separate Answer-Script for each Part

Answer *any three* questions from this part.

*Two* marks are reserved for neat and well organised answer

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|----|--|----|
| 6. | a) Explain briefly with block diagram the closed loop speed control scheme of dc separately excited motor below rated speed.   | 8  |
|    | b) Derive and draw transfer function block diagram for separately excited D.C. motor.  | 8  |
| 7. | a) Discuss with necessary diagram the closed loop speed control of a separately excited D.C. motor using current and position feedback.                                      | 8  |
|    | b) Discuss with necessary circuit diagram the IR compensation scheme of a dc separately excited motor.   | 8  |
| 8. | Explain why voltage control method of D.C .motor is called constant torque and field control method for speed control is called constant power operation.                    | 8  |
|    | b) Explain the speed control of induction motor based on stator frequency variation.<br><br>What is the advantage and disadvantage of above method of speed control.         | 8  |
| 9  | a) Explain with suitable block diagram the open loop V/f control scheme of a three phase induction motor. Discuss the disadvantages of the above scheme.                     | 10 |
|    | b) The speed of a 1 kW, 1440 rpm, 415V, three phase cage type induction motor is to be controlled with the help of an inverter following V/f technique. Find the motor input | 6  |

voltage and frequencies when the given speed references are (i)300 rpm (ii) 600 rpm (iii) 1750 rpm all at no load. Assume stator and rotor resistances of 1.0 ohm with negligible stator and rotor leakage reactance and a no load current of 1.0 A , 0.2 pf lag at rated condition.

10 Write short notes on any Two:

8 + 8

- a) Speed control of dc separately excited motor above rated speed.
- b) Speed control method of synchronous motors.
- c) Thermal protection of motors.
- d) Over voltage and under voltage protection of drive system.