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**Question Paper Code : 81252**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2025.

Fifth/Sixth/Seventh Semester

Electrical and Electronics Engineering

EE 3012 — ELECTRICAL DRIVES

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Mention the different components of load torque.
2. Draw the basic block diagram of an electrical drive.
3. List the types of DC-DC choppers.
4. Define four quadrant operation.
5. What are the features of variable frequency control?
6. Draw the block diagram of closed loop control of induction motor drives.
7. List out the characteristics features of synchronous motor drive.
8. What are the additional control strategies available for PMSM drives?
9. Define back emf constant. Also mention its unit.
10. What are the factors to be considered for selection of converter for electrical drives?

PART B — (5 × 13 = 65 marks)

11. (a) Describe the multi quadrant operation of an electric drive with motor/load torque characteristics. Also discuss the effect of speed variation and speed reversal.

Or

(b) Classify the motor duty cycles and explain the selection of motor by considering load and thermal variation factors.

12. (a) Explain the operation of a single-phase converter-fed DC motor with waveforms.

Or

(b) Explain the operation of chopper controlled dc series motor for motoring and braking with circuit diagrams and waveforms.

13. (a) Explain the of operation constant V/f control of induction motor and draw the waveforms.

Or

(b) Explain CSI fed induction motor drive with its regenerative mode and multiquadrant operation.

14. (a) Describe the principle operation of separate and self-control mode of synchronous motor.

Or

(b) Explain the construction and working of permanent magnet synchronous motor with neat diagram.

15. (a) Draw the diagram and Derive the transfer function of a DC motor load converter system.

Or

(b) Explain how current controller and speed controllers are designed for electric drives with suitable mathematical expressions.

PART C — (1 × 15 = 15 marks)

16. (a) A 250V, shunt motor with armature resistance of 0.6 ohm runs at 600 rpm on full load and takes an armature current 25A. If resistance of 1.0 ohm is placed in the armature circuit, find the speed at

(i) Full load torque. (7)

(ii) Half full-load torque. (8)

Or

(b) A star connected squirrel cage induction motor has following ratings and parameters: 400 V, 50 Hz, 4 pole, 1370 rpm, $R_s$ = 2 ohm, $R_r'$ = 3 ohm, $X_s = X_r'$ = 3.5 ohm, $X_m$ = 55 ohm.

It is controlled by a CSI at a constant flux. Calculate

(i) motor torque, speed and stator current for 30Hz and rated slip speed. (7)

(ii) Inverter frequency and stator current for rated motor torque and motor speed of 1200 rpm. (8)