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Roll No. _____

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B. Tech. VI - Sem. (Main) Exam., (Academic Session 2021- 2022)

Electrical & Electronics Engineering

6EX4 – 05/6EE4-05 Electric Drives

Common with EEE & EE

Time: 2½ Hours

Maximum Marks: 120

Min. Passing Marks:

Instructions to Candidates:

**Part – A: Short answer questions (up to 25 words) 6×3 marks = 18 marks.
Candidates have to answer six questions out of ten.**

**Part – B: Analytical/Problem solving questions 3×10 marks = 30 marks.
Candidates have to answer three questions out of seven.**

**Part – C: Descriptive/Analytical/Problem Solving questions 3×24 marks = 72 marks.
Candidates have to answer three questions out of five.**

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. NIL

2. NIL

PART – A

Q.1 Draw the block diagram of an electric drive.

Q.2 Mention the application of electrical drives.

✓ Q.3 Define four-quadrant operation.

Q.4 Why single-phase induction motor is not self starting?

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- Q.5 What is meant by voltage control in induction motor and where it is applicable?
- Q.6 What is the basic principle in V/f control?
- Q.7 Define slip power control. What is meant by slip power recovery system?
- Q.8 State the different modes of operation of three-phase induction machines.
- Q.9 What are the different types of slip power recovery scheme?
- Q.10 What are the advantages of slip-power recovery system?

PART – B

- Q.1 Derive the transfer function of a DC motor and load.
- Q.2 Explain the principle of operation of chopper fed drives.
- Q.3 Draw and explain the speed torque characteristics of a variable stator voltage controlled induction motor. Why stator voltage control is not suitable for speed control of induction motor with constant load torque?
- Q.4 Describe dynamic braking operation of chopper fed separately excited DC motor drive. Draw speed-torque curves in motoring and breaking mode.
- Q.5 What is the need for current controller? Explain the operation of hysteresis current control scheme.
- Q.6 What is field oriented control of induction motor? Why it is superior to other types of speed control?
- Q.7 Draw the circuit diagram and explain the operation of any one slip-power-recovery scheme induction motor drive.

PART - C

- Q.1 With neat circuit diagrams, explain chopper fed four quadrants DC drive.
- Q.2 A 250 V separately excited DC motor has an armature resistance of 2.5Ω , when driving a load at 600 rpm with constant torque, the armature takes 20 A. This motor is controlled by a chopper circuit with a frequency of 400 Hz and an input voltage of 250 V -
- (a) What should be the value of the duty ratio if one desires to reduce the speed from 600 to 400 rpm, with the load torque maintained constant?
- (b) What should be the minimum value of the armature inductance, if the maximum armature current ripple expressed as a percentage of the rated current is not to exceed 10%?
- Q.3 Explain working of current control loop and speed control loop for close loop control of separately excited DC motor drive. <https://www.btubikaner.com>
- Q.4 Derive the torque equation of a three-phase induction motor from the basics and obtain the speed-torque characteristics.
- Q.5 (a) A three-phase induction motor is supplied from a 50 Hz supply and runs at 1200 rpm when the slip is 4%. Determine the synchronous speed.
- (b) Explain in detail, the rotor resistance method of speed control of a slip ring induction motor.