

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: EE308

Course Name: Electric Drives

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

Marks

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| 1 | What are the functions of power modulator in an electric drive? | (5) |
| 2 | A single phase fully controlled converter is used to control a DC separately excited motor of 200V, 900rpm, 100A with armature resistance of 0.06Ω . AC source voltage is 210V, 50Hz. Determine firing angle for rated motor torque and 700rpm. | (5) |
| 3 | With detailed analysis explain how chopper helps to control a separately excited DC motor drive in motoring mode | (5) |
| 4 | How speed of the induction motor can be controlled using stator frequency control. | (5) |
| 5 | Differentiate VSI fed induction motor drive with CSI fed induction motor drive | (5) |
| 6 | Explain field orientation control of induction motors. | (5) |
| 7 | Explain in detail about the different types of PM synchronous motor? | (5) |
| 8 | Explain how speed control can be done in a set of multiple synchronous motors | (5) |

PART B

Answer any two full questions, each carries 10 marks.

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| 9 | a) Illustrate four quadrant operation of drive considering hoist as an example | (6) |
| | b) Draw the Torque – Speed characteristics of the following loads
(i) Centrifugal pump (ii) Traction load | (4) |
| 10 | a) With the help of block diagram explain in detail about the closed loop speed control of DC motor | (5) |
| | b) Draw the armature voltage and armature current waveforms of 3 phase semi-converter-fed DC motor drive for $\alpha=60^\circ$. | (5) |
| 11 | a) Give one application of dual converter for speed control of DC motor. | (5) |
| | b) A 220V, 1500rpm, 50A separately excited motor with armature resistance of 0.5Ω is fed from a circulating current mode dual converter with a source voltage | (5) |

of 165V (line). Determine converter firing angle for the following operating points.

- (i) Motoring operation at rated motor torque and 1000rpm
- (ii) Braking operation at rated motor torque and 1000rpm.

PART C

Answer any two full questions, each carries 10 marks.

- 12 List different types of cycloconverters. Explain single phase step down cycloconverter with circuit diagram and waveforms. (10)
- 13 a) Describe dynamic braking operation of chopper fed separately excited DC motor drive. Draw speed-torque curves in motoring and braking mode (5)
- b) Describe speed control of induction motors using three phase ac voltage controller. (5)
- 14 What are the slip power recovery control schemes of induction motors. Explain how static Kramer drive is used to control the speed of induction motors. (10)

PART D

Answer any two full questions, each carries 10 marks.

- 15 Discuss the operation of CSI fed induction motor drive. Explain its regenerative braking and multi-quadrant operation. (10)
- 16 a) Give the concept of basic transformation in reference frame theory applied to induction motors. (5)
- b) Explain in detail about self-control mode of operation of synchronous motor (5)
- 17 With block diagram, explain the operation of microcontroller based permanent magnet synchronous motor drives. (10)
