

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION MO: 22)

CLASS: BTECH
BRANCH: ECE

SEMESTER: VII
SESSION: MO/2022

SUBJECT: EC401 INDUSTRIAL ELECTRONICS

TIME: 03 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. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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- Q.1(a) Define latching current and holding current. Show these currents in V-I characteristics. [2]
Q.1(b) What is a thyristor? How has this term coined? [3]
Q.1(c) Describe the gate triggering of a thyristor. Does the gate current has any effect on the forward break over voltage? [5]
- Q.2(a) Write at least five applications of phase-controlled rectifiers. [2]
Q.2(b) A resistive load of 10Ω is connected through a half-wave SCR circuit to a 220V, 50Hz single-phase source. Calculate the power delivered to load for a firing angle of 60 degrees. [3]
Q.2(c) A single-phase half-wave rectifier circuit feeds power to a resistive inductive load. Draw waveforms for source voltage, load voltage, load current, and the voltage across the SCR for a given firing angle α . [5]
- Q.3(a) Enumerate the applications of DC choppers. [2]
Q.3(b) Describe the principle of DC chopper operation. Derive an expression for its average output voltage. [3]
Q.3(c) Describe the principle of phase control in a single-phase half-wave ac voltage controller. Derive expressions for the average and RMS value of output voltage for this voltage controller. [5]
- Q.4(a) Explain the need for commutation in the thyristor circuit. [2]
Q.4(b) Draw the circuit diagram of McMurray original single-phase half-bridge inverter and McMurray modified single-phase inverter. Explain its working principle. [3]
Q.4(c) What is an inverter? Describe the working of a single-phase half-bridge inverter. What is its main drawback and how this drawback is overcome? [5]
- Q.5(a) Explain the concept of electric drives. Illustrate your answer with examples. [2]
Q.5(b) Explain the constant torque drive and constant power drive for separately excited dc motors. [3]
Q.5(c) A separately excited dc motor is supplied from a 230V, 50Hz source through a single phase half wave controlled rectifier. Its field is fed through a single-phase semi-converter with zero firing angle. Motor resistance is 0.7Ω and motor constant is 0.5 V-sec/rad. For rated torque of 15 Nm at 1000rpm. Calculate the firing angle delay of the armature converter. [5]

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