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S.E. (Robotics & Automation Engineering)
INDUSTRIAL ELECTRONICS AND ELECTRICAL TECHNOLOGY
(2019 Pattern) (Semester - III) (211501)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

1) *Solve Q1 or Q2; Q3 or Q4; Q.5 or Q.6; Q.7 or Q.8.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable additional data, if necessary.*
5) *Use of a non-programmable calculator is allowed.*

Q1) a) Draw the schematic showing the interfacing of an ATmega-based Arduino board to a DC motor with L293D. **[4]**

b) Explain the concept of Pulse Width Modulation (PWM). **[6]**

c) Draw and explain the interfacing of the Accelerometer with Arduino ATmega 328P. Write its algorithm. **[8]**

OR

Q2) a) Draw a neat schematic showing the interfacing of temperature sensor LM 35 with ATmega 328P-based Arduino board. The output of LM 35 is connected to analog pin A4 of the Arduino board. Write the algorithm for the same. **[8]**

- What is the operating temperature range of LM 35?

- How many pins are available for the LM 35 sensor?

- What is the output voltage of LM 35 per degree Celsius temperature?

b) Draw a neat diagram showing the interfacing of the strain gauge with an ATmega 328P-based Arduino board. Given that the output voltage from the strain gauge after signal conditioning is connected to analog pin A0 of the Arduino board. Write algorithmic steps to display strain on the serial monitor. **[6]**

c) Explain the concept of ADC in ATmega 328P-based Arduino board.**[4]**

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Q3) a) Draw and explain the Speed-armature current characteristics and torque-armature current characteristics of the DC shunt motor. **[6]**

b) Write any four industrial applications of the DC series and DC shunt motor. **[4]**

c) Draw the schematic of the three-point starter used for the DC shunt motor. Indicate the following components of the three-point starter and write their functions during operation: (i) No volt coil; (ii) Overload release. **[7]**

OR

Q4) a) State and explain the working principle of the DC generator along with a diagram. **[6]**

b) Derive the expression for the torque of the DC machine. **[7]**

c) What is the back emf in the DC motor? Write the emf equation of the DC generator. **[4]**

Q5) a) Distinguish between squirrel cage and slip ring induction motors. Write **any four** valid points. **[4]**

b) Derive the expression for the torque developed in a three-phase induction motor under running conditions. **[8]**

c) The useful torque of the three-phase, 50 Hz, an 8-pole induction motor is 190 NM. The frequency of the rotor is 1.5 Hz. Calculate the rotor copper loss if the mechanical losses are 700 watts. **[6]**

OR

Q6) a) Explain the operation of star - delta starter used for three phase induction motor with the help of a neat schematic diagram. **[8]**

b) Explain constructional details of three-phase IM with its appropriate diagram. **[6]**

c) Write any four industrial applications of the induction motor. **[4]**

Q7) a) What is a linear induction motor? Draw its diagram. **[4]**

b) Describe the construction and working of the Universal motor with the help of suitable diagrams and state its two applications. **[7]**

c) Explain the construction and working of the shaded pole induction motor with the help of a suitable diagram. **[6]**

Q8) a) Describe the construction and working of Brushless DC (BLDC) motor with the help of a suitable diagram and state any two applications of it.

[7]

b) Describe the constructional details and operation of the capacitor start capacitor run induction motor with the help of diagrams. **[6]**

c) Differentiate AC and DC motors. Write any four valid points. **[4]**

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