Name: **Enrolment No:**	

UPES

End Semester Examination, December 2023

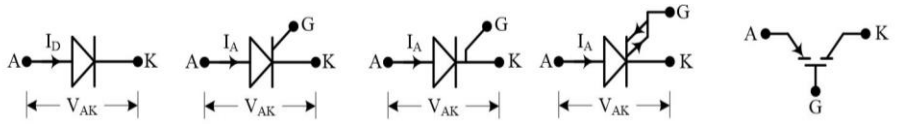
Course: Engineering System Components — **Semester: I**

Program: M.Tech (Robotics Engineering) — **Time: 03 hrs.**

Course Code: ECEG7036 — **Max. Marks: 100**

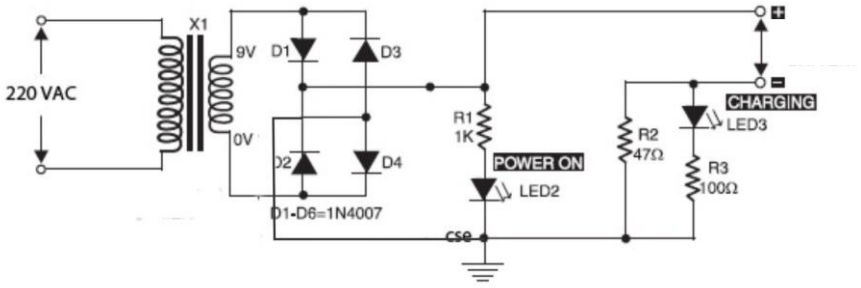
Instructions: Assume any data if missing.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Write the name and application of each device shown below. 	**4**	**CO3**
Q2	Elucidate the constructional features of lead acid batteries with the help of chemical equations.	**4**	**CO1**
Q3	A 200V DC shunt motor runs at 600 rpm when the armature current is 30A. Calculate the speed if the torque is doubled. Given that Ra = 0.18Ω.	**4**	**CO4**
Q4	Is there any significant difference between a microprocessor and a PLC?	**4**	**CO2**
Q5	What is PID control? Explain in brief the benefits of P, I, D controller individually.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q6	Draw the block diagram of any one microcontroller system used in autonomous robots. Explain the functions of each sub-block in brief.	**10**	**CO2**
Q7	Design a 3-bit up counter by using JK Flip-Flops and discuss various applications of these counters.	**10**	**CO3**

Q8	Illustrate different methods of speed control for DC motors. Explain with the help of equations in detail.	**10**	**CO4**
Q9	Differentiate between sensors and transducers? Name two sensors and two transducers to measure each of the following physical quantities: a) Temperature b) Pressure c) Liquid level d) Flow	**10**	**CO1**
	SECTION-C **(2Qx20M=40 Marks)**		
Q10	Identify the circuit shown below and explain the working principle & circuit with suitable waveforms in detail. 	**20**	**CO4**
Q11	Show that the controlled half-wave rectifier and full wave rectifier with a resistive load have the power factor of $pf_{HW} = \sqrt{\frac{1}{2} - \frac{\alpha}{2\pi} + \frac{\sin 2\alpha}{4\pi}}$ and $pf_{FW} = \sqrt{1 - \frac{\alpha}{\pi} + \frac{\sin 2\alpha}{2\pi}}$ Also, explain the significance of power factor in rectifier circuits. OR The three-phase alternating voltage is given by V=415×sin (314t-α). Calculate a) frequency b) line voltage c) phase voltage d) phase current for a load of 300W and at α=0 e) phase current for a load of 300W and 400VAR at α=0 Also draw the balance supply system for three phases mentioning the values of phase angle for each phase.	**20**	**CO3**