



B.E DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

Fifth Semester

AUTOMOBILE ENGINEERING

U18AUT5001: Automotive Electronics

COURSE OUTCOMES

- CO1:** Exposure on fundamentals of electronic components.
CO2: Design the power supply for the given specification.
CO3: Construct the digital circuit using logic gates for the given logical operation.
CO4: Familiarize the student with electronic component functions involved in automotive electronic circuits.
CO5: Explain the working principle of application specific electronic control unit.
CO6: Construct the ECU architecture for the given application.

Time: Three Hours

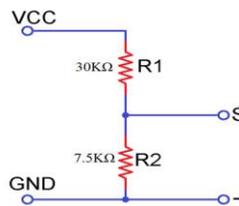
Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

(Answer not more than 40 words)

1. Apply the voltage division rule to find the output voltage across 30 kΩ and 7.5 kΩ resistors if the input voltage is 25 V. CO1 [K₃]



2. Tabulate the different configurations of BJT. CO1 [K₂]
3. Interpret the significance of voltage regulator in a power supply design. CO2 [K₂]
4. Explain the knee voltage and Zener knee region of a Zener diode. CO2 [K₃]
5. Build a logic circuit for staircase wiring. CO3 [K₃]
6. Convert 1011 0111 0110 1110 to Hexa decimal number and decimal number. CO5 [K₃]
7. Calculate the ON time, OFF time, Total time period, duty cycle and frequency of the output generated by an astable multivibrator using resistors R1 = 5kΩ, R2 = 5kΩ and capacitor C = 10μf. CO3 [K₂]
8. Explain sampling and quantization. CO4 [K₃]
9. Give the significance of an ECU. CO5 [K₂]
10. Compare open loop and closed loop systems. CO6 [K₂]

Answer any FIVE Questions:-
PART B (5 x 16 = 80 Marks)
(Answer not more than 400 words)

11. a) Design a circuit for speed control of DC motor using 555 timer and explain. 16 CO4 [K₃]
 12. a) Design the simple adaptive lighting system using LDR. 16 CO4 [K₃]
 13. a) Design a power supply using Voltage Regulator IC7805 and Bridge Rectifier for given Specification. 16 CO2 [K₂]

Min Input Voltage (V_{in})	230-10% V AC
Max Input Voltage (V_{in})	230+10% V AC
Output Voltage (V_{out})	5 V DC
Load current (I_L)	1 A
Ambient Temp $^{\circ}$ C	30 $^{\circ}$ C

14. a) Explain the construction and working of PN junction diode. Also explain the VI characteristics of the diode. 8 CO1 [K₃]
 b) For given specifications Design a switching circuit for the Green LED Load using NPN transistor. 8 CO1 [K₃]
 Transistor: 2N3904 Load Voltage VCC: 5V and Vce = 0.3V
 Transistor base Input voltage Vb: 2.5V Collector current Ic: 15mA
 Overdrive factor = 10 and gain = 60
15. a) Draw the block diagram of an airbag ECU system with necessary explanation. 8 CO6 [K₂]
 b) Explain the working and block diagram of Battery Management System. 8 CO6 [K₂]
16. a) Apply the concept of logic gates to build a logic circuit for the following conditions of a washing machine. 16 CO3 [K₃]
 D = 0 ----- Door Open; D = 1----- Door Closed
 L = 0 -----Water Level is LOW; L = 1 -----Water Level is HIGH
 T = 0 -----Temperature is LOW T = 1 -----Temperature is HIGH
 The truth table for this application can be developed by logical reasoning:
 1. For turning ON of any of the output devices, the washing machine door/lid should be closed at any point of time, so only last four cases of the truth table should be considered where D takes a value 1.
 2. If door is closed & the water level is low, the water valve should be turned ON.
 3. If door is closed, the water level is satisfactory & the temperature is low, the heater should be turned ON.
 4. Whereas when the door is closed, water level is satisfactory and the temperature is right, the motor should turn ON.
