The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Mechanical Engineering

Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	: **DMX4342 Applied Automotive Electronics**
Academic Year	: 2020/21
Date	: 19th February 2022
Time	: 09:30 – 12:30 hrs.
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **six (6)** questions in **five (4)** pages.
3. Answer **Q1**, which is **compulsory** and **Three** other questions. Answer for each question should commence from a new page.
4. This is a **Closed Book Test** (CBT).
5. Answers should be in clear handwriting and do not use Red colour pen.

Question 01(Spend approximately one hour) [40 Marks]

Figure Q1 shows a complete circuit diagram of an electronic ignition system with magnetic reluctor generator.

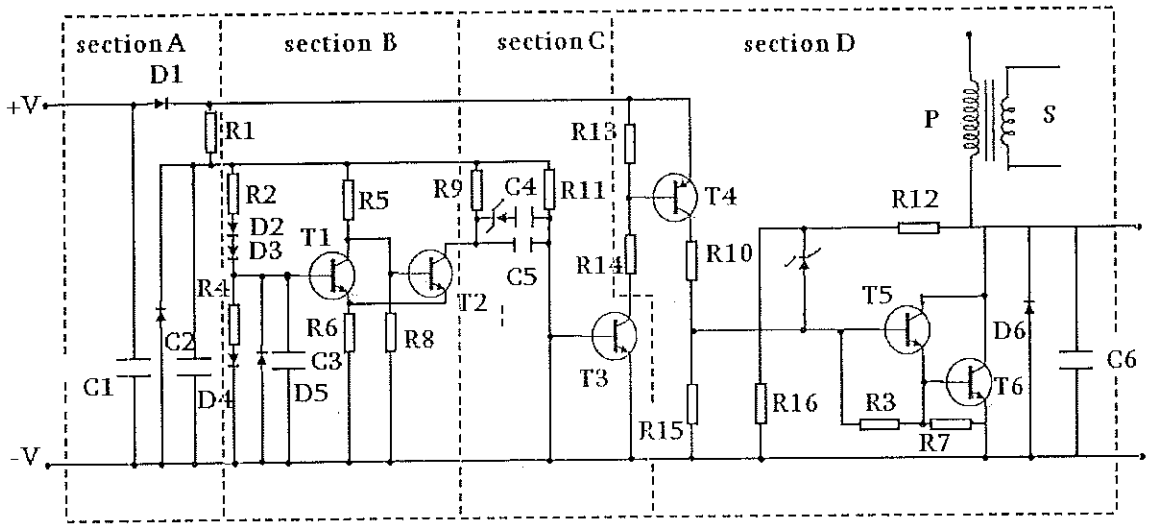


Figure Q1

i) Explain the functional operation of the ignition system. [06]

ii) Draw the block diagram of the electronic ignition system. [06]

iii) What are the important functions of an electronic control system? [08]

iv) State the functional operation of **section B** in figure Q1. Briefly explain the electronic operation of **section B**. [08]

v) State the functional operation of **section D** in figure Q1. Briefly explain the electronic operation of **section D**. [06]

vi) What are the functions of **T5** and **T6**? [06]

Question 02

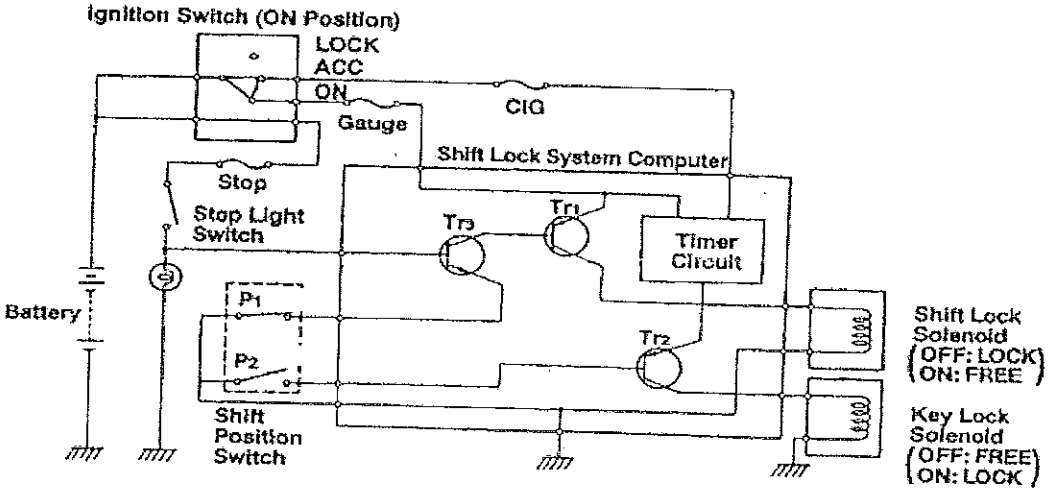
The Electronic Control Transmission (ECT) is an automatic transmission which uses modern electronic control technologies to control the transmission. The transmission itself, except for the valve body and speed sensor, is virtually the same as a full hydraulically controlled transmission, but it also consists of electronic parts, sensors, an electronic control unit and actuators.

i) Explain the function of electronics in ECT. [04]

ii) What are the two types of throttle position sensors associated with ECT transmission? Explain them briefly. [08]

iii) What is the sensor arrangement used in ECT ECU to ensure that vehicle speed kept at the correct speed at all times? Explain functions of each sensors. [08]

Question 03



FigureQ3

Figure Q3 shows a circuit diagram of a shift lock control system. The shift lock system computer controls the operation of the key lock solenoid and the shift lock solenoid based on the signals from the shift position switch and the stop light switch.

i). What are the shift interlock systems available in vehicles? [04]

ii). Explain the functional operation of key lock solenoid when the shift position switch is in "on" position (closed) and in "off" position (open). [08]

iii). Explain the functional operation of shift lock solenoid when the shift lever is in the park range (shift position switch P1 is on) and when the brake pedal is depressed. [08]

Question 04

i). Draw the circuit diagram of a modern automotive alternator charging system showing its main functional components. [06]

ii). Draw the output voltage wave form of the alternator. [04]

iii). Draw the schematic diagram of an alternator showing the main electrical and electronic components. Show the voltage regulator as a functional block. [07]

iv). What is the function of the Diode Bridge? [03]

Question 05

i). Briefly explain the following terms.
   a. Digital signal
   b. Analog to Digital converter
   c. Digital to Analog converter [03]

ii). Name three types of "resistive sensors" and provide an example for each. [02]

iii). Name two types of "Actuators" and provide an example for each. [02]

iv). In *automotive electronics*, the basic system consists of input, process and output. Overall this is called a control system. Explain the advantages of the closed loop control system over the open loop control system. [06]

v). Subroutines, Memory table (or Memory map) and Interrupts are important factors of microprocessor based automotive control systems. Explain their utilization. [07]

Question 06

The circuit shown in the Figure Q6 is a +10V regulated DC power supply for load currents from 0 to 100 mA. Input voltage can vary from 20 -25 V. Allow at least 10 mA Zener current at all conditions. Assume h_{FE} =50.

i). Determine suitable values for the resistors R and R_C. [06]

ii). Calculate the worst case dissipation in the transistor and the Zener. [04]

iii). Calculate the percentage change in Zener current from no load condition to full load condition. [05]

iv). If the supply has ripples of frequency 60 Hz and its multiples, determine a suitable value for C. [05]

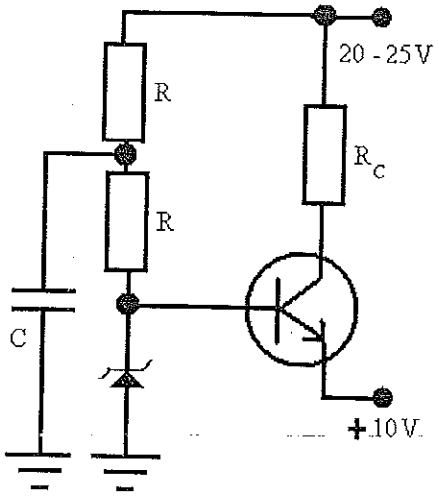


Figure Q6

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