00047

THE OPEN UNIVERSITY OF SRI LANKA
FACULTY OF ENGINEERING TECHNOLOGY
LEVEL 4
FINAL EXAMINATION-ACADEMIC YEAR 2010/2011
MEX4242/ECX4240 AUTO MOTIVE ELECTRONICS
DATE : 27TH MARCH 2011
TIME : 1400 HRS.-1700HRS.
DURATION : THREE HOURS [3 HRS.]

READ THE FOLLOWING INSTRUCTIONS BEFORE ANSWERING THE PAPER

Instructions:

1. *This question paper consists of six questions.*
2. *Answer **Question 01**, which is **compulsory** and **three** others.*

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

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

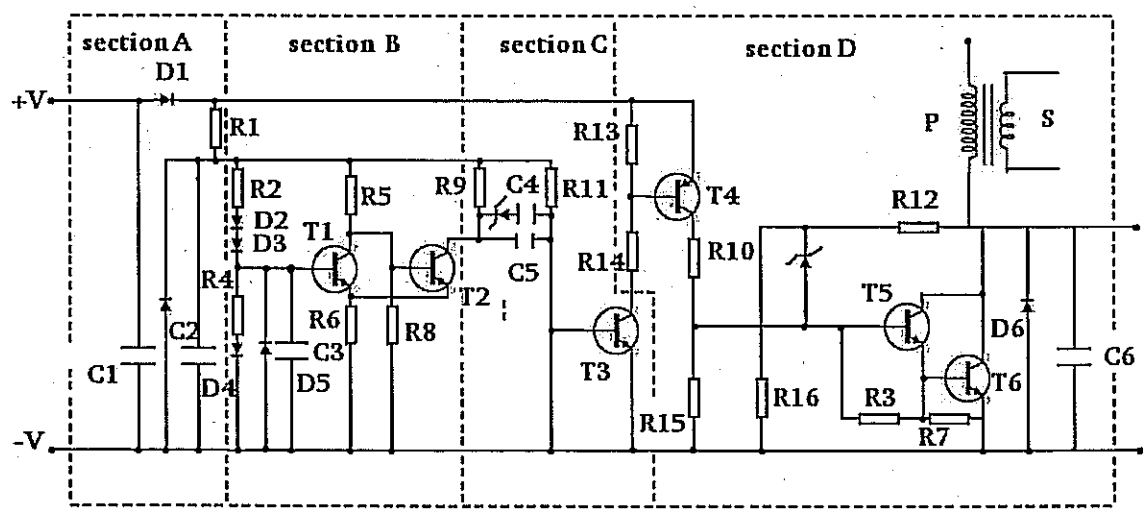


Figure Q1

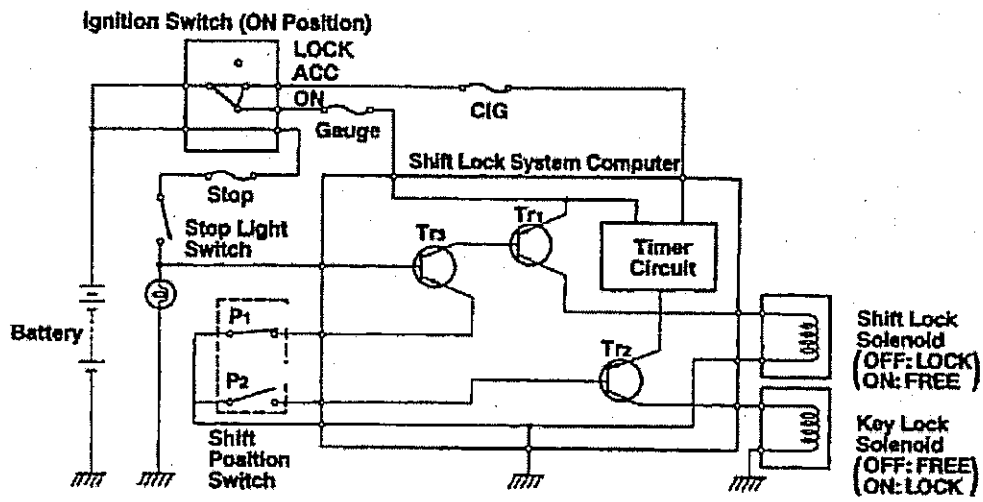
i) Explain the functional operation of the ignition system.
ii) Draw the block diagram of electronic ignition system.
iii) What are the important functions of electronic control system?
iv) State the functional operation of the **section B** in Figure Q1 and briefly explain the electronic operation of the **section B**.
v) State the functional operation of the **section D** in Figure Q1 and briefly explain the electronic operation of the **section D**.
vi) What is the function of **T5** and **T6**?

Question 02 [20 Marks]

The Electronics 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 part in ECT.
ii) What are the two types of throttle position sensors associated with ECT transmission? Explain briefly.
iii) What is the sensors arrangement used in ECT Electronic Control Unit to ensure that vehicle speed is kept at correct speed at all times? Explain the function of each sensor.

Question 03 [20 Marks]



FigureQ3

Figure Q3 is a shift (gear lever) lock control system. The shift lock system computer controls operation of the key lock solenoid and the shift lock solenoid based on signals from the shift position switch and the stop light switch.

i) What are the shift interlock systems available in vehicles?
ii) Explain the functional operation of key lock solenoid when the shift position switch is in on position (closed) and off position (open).
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.

Question 04 [20 Marks]

i) Explain the purpose of Mass Air Flow sensor?
ii) List the different types of Mass Air Flow sensors?
iii) Explain in detail the construction and operation of Hot Wire Mass Air Flow sensor shown in Figure Q4-1?
iv) Explain the operation of Vane Mass Air Flow sensor shown in FigureQ4-2?

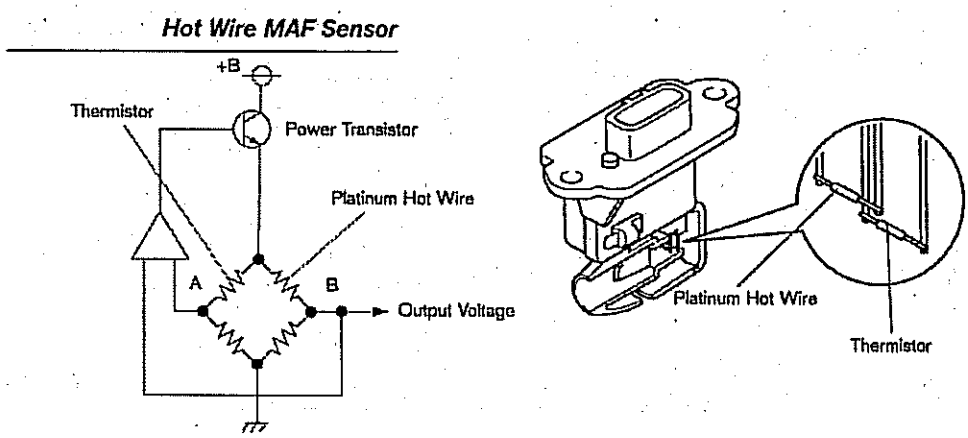


Figure Q4-1

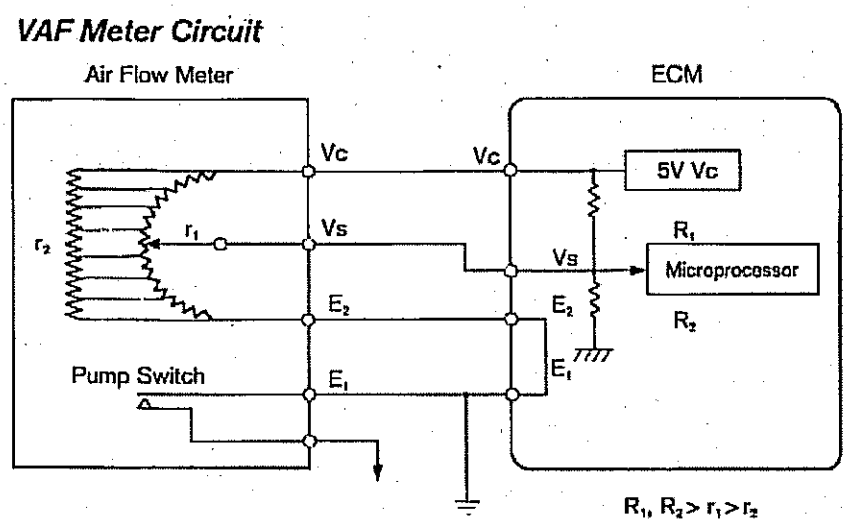


Figure Q4-2

Question 05 [20 Marks]

i) What are the half wave and full wave rectification methods (two methods). Explain it using circuit diagrams. And draw the output for a sinusoidal and square wave inputs.

ii) Sketch the current-voltage relationship of a Zener diode in forward-biased and reverse-biased conditions.

iii) The circuit shown in Figure Q5 is an emitter follower regulation circuit. Calculate the values of V_L, I_L, V_{CE} and the power dissipated by T_1. Assume that the transistor is ***Si(Silicon)***.

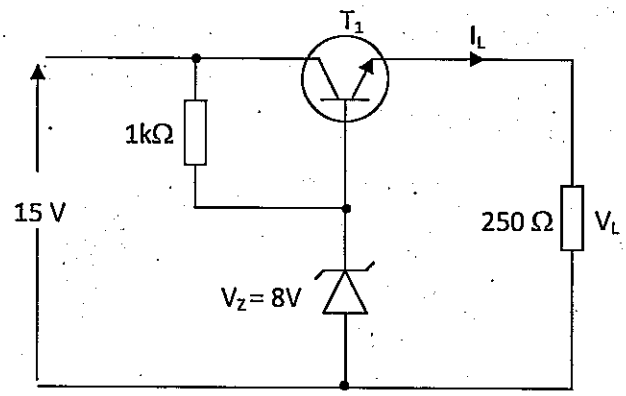


Figure Q5

Question 06 [20 Marks]

i) Explain briefly the terms "Combinational-logic" and "Sequential-logic".

ii) Define,
   a) JK edge-triggered Flip-Flop
   b) SR edge-triggered Flip-Flop
   c) Construct D edge-triggered Flip-Flop using a JK Flip-Flop and a NOT gate.

   Give circuit diagrams, truth tables for each of them.

iii) Design a 3-bit synchronous counter using JK Flip-Flop and logic gates. You have to show the state diagram, state table, K-map, logic expressions and the circuit implementation very clearly.

-End-