

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Programme: B. Tech (Mechatronics)
Course Name: Automotive Mechatronics
Course Code: ADEG 343
No. of page/s: 2

Semester : VI
Max. Marks : 100
Duration : 3 Hrs

SECTION A

All questions are compulsory and carry equal marks.

S. No.	Question	Marks	CO
Q 1	List out basic components of four-stroke engines with neat sketch.	5	CO1
Q 2	Elaborate need of voltage regulator. With neat diagram explain working of electromechanically type voltage regulator.	5	CO2
Q 3	Automotive Electrical and Electronic systems are divided into clusters of related functions so called vehicle <i>domains</i> . Briefly explain vehicle domain and related system.	5	CO2
Q 4	What is X by wire system? Classify different system which comes under X by wire system.	5	CO3

SECTION B

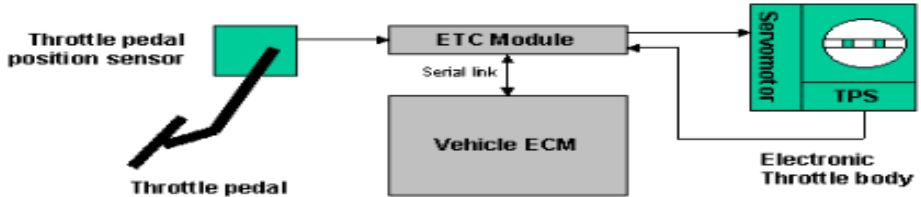
Answer any four questions.

Q 5	With neat diagram illustrate classical waterfall model and V model software development life cycle (SDLC). Also describe various tool and technology used in V cycle software development life cycle process.	10	CO3
Q 6	Analyze why alternator prefers with respect with DC generator? Describe with the help of neat diagram the construction and working details of alternator.	10	CO3
Q 7	In this generation of cars, almost all functions are electronically controlled – and also interlinked. Together with the increasing number of variants, this led to a quantum leap in the complexity of the resulting overall E/E system. With appropriate five facts explains, Automobiles had changed from machinery to systems of E/E systems.	10	CO5
Q 8	Design electronic stability program (ESP) system. The following parameters must be included in designing: Block diagram, replacement of mechanical component with sensors and actuators and circuit diagram. How understeer and oversteer got eliminated in ESP equipped vehicle. OR	10	CO4
	Using appropriate example explain five different types of error handling mechanism	10	CO4

used in CAN bus system.

SECTION-C
Answer all the questions.

Q 09 A) Design a circuit using electromechanical relay or optical relay to drive throttle control system which is represented below.



B) Define In-Vehicle-Networking. List out major protocol used in In-Vehicle-Networking for automobile. (Clearly distinguish each protocol in terms data rate, ET/TT , Fault tolerance mechanism or any others.)

10 + 10 **CO4**

OR

Design a hydraulic circuit for antilock braking system (ABS), where system pressure is 15 bar. Assume appropriate solenoid operated directional control valve and actuator. With appropriate logic, control hydraulic circuit of antilock braking system. List out major advantages and disadvantages with conventional system.

20 **CO4**

Q 10 1) Considering three node want to transmit data through CAN bus and 11bit identifier for

- Node 1 is 11001011111
- Node 2 is 11001111111
- Node 3 is 11001011001.

Assume node 1 is RPM sensor, node 2 is coolant temperature sensor and node 3 is accelerator pedal position sensor, with respect to graphical representation elucidate CAN bus arbitration process and prove it follows CSMA/CD-CR protocol.

2) With neat diagram explain Single point injection system and Multi point injection system. Name three advantageous of a single point injection system and multi-point injection system? What is the Driving Pressure in single point and multi point injection system?

20
(10+10) **CO5**

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SECTION A

All questions are compulsory and carry equal marks.

S. No.	Question	Marks	CO
Q 1	Classify engine with respect to injection technology.	5	CO1
Q 2	Explain need of charging system in the vehicle.	5	CO2
Q 3	What is ECU in the vehicle? Broadly classify different types of ECU.	5	CO2
Q 4	Explain hold in coil and pull in coil in starter solenoid.	5	CO3

SECTION B

Answer any four questions and carry equal marks.

Q 5	With block diagram explain working of electronic throttle by wire system. Also explain different sensor and actuators used in the system.	10	CO3
Q 6	Using appropriate example explain five different types of error handling mechanism used in CAN bus system.	10	CO4
Q 7	Explain working of overrunning clutch based drive techniques used in conventional automobile with neat diagram.	10	CO5
Q 8	With neat circuit diagram explain the operation of starting system used in the vehicle.	10	CO4
Q 9	Analyze why alternator prefers with respect with DC generator? Describe with the help of neat diagram the construction and working details of alternator.	10	CO3

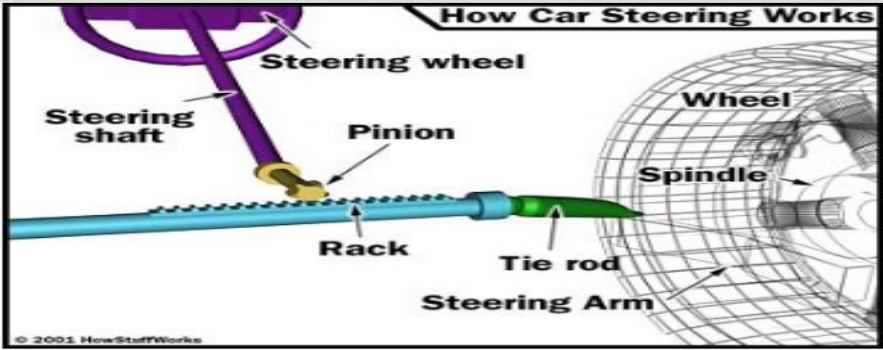
SECTION-C

Answer all the questions.

Q 10.A	A) Design a brake warning light electrical circuit with appropriate electromechanical	10 +10	CO4
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relay. Assume brake warning light require 12 Volt and 3 Ampere current, whereas relay require 12V and 10mA. In brake warning light electrical circuit incorporate Parking brake pedal as one input and Foot brake pedal as another inputs to the system.

B) Explain with block diagram steer by wire system; also explain different sensor and actuators used in the system.



OR

Design a hydraulic circuit for steering system which is represented in above figure. Assume hydraulic motor as actuator and 4/3 solenoid operated directional control valve as control unit. Solenoid must be controlled through relay logic or any other logic. List out advantages and disadvantages of electronic power steering system.

20

CO4

Q 11

Consider the behavior and system diagram of GDI engines under different operating and design conditions is represented in below figure. With statistical data or appropriate graph elaborate the following (any five):

- a. Injector Location
- b. Driving fuel Pressure
- c. Droplet size
- d. Power generation comparison with other engine
- e. Performance w.r.t. fuel economy.
- f. Usage of canister and canister electro valve

20
(5*4)

CO5

1. Fuel tank
2. Electric Fuel Pump low pressure
3. Canister
4. Canister electro-valve
5. **High Pressure Fuel Pump**
6. Rail
7. Fuel Rail Pressure Sensor
8. **Direct Injectors**
9. Air Filter
10. Compressor
11. Intercooler
12. **Electronic Throttle Body (DC-motor)**
13. **Electronic EGR Valve (DC-motor)**
14. Pressure + Temperature sensor
15. Intake Manifold Pressure + Temperature Sensor
16. Engine Speed (Crankshaft) Sensor
17. Camshaft Position Sensor
18. Oil Minimum Pressure Switch
19. Coolant Temperature Sensor
20. Spark Plugs
21. Pencil Coils rail with high power driver inside
22. Turbine
23. FGT actuator (Waste gate)
24. FGT Vacuum Modulator
25. VGT actuator
26. VGT Vacuum Modulator
27. Up stream Lambda sensor
28. Close Coupled Catalyst
29. Down stream Lambda sensor
30. Knock Sensor
31. Pedals Assembly
32. **Engine Control Unit**
33. Pop-Off Vacuum Modulator
34. Pop-Off valve
35. WT intake/exhaust actuator

