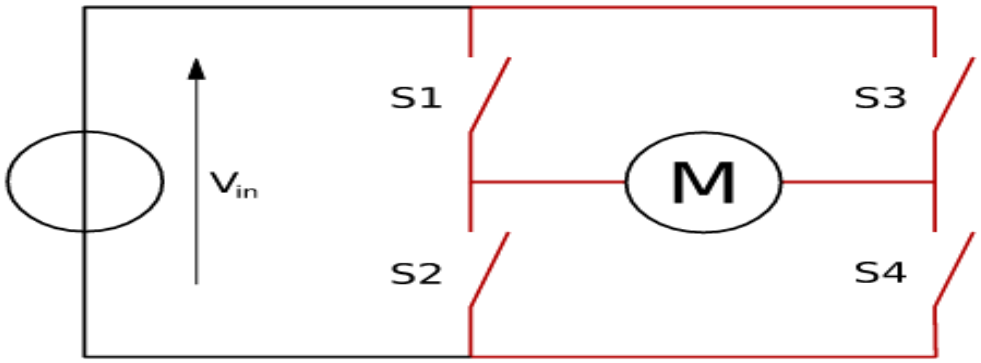
Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2018

Programme: B.Tech (Mechatronics) **Semester :** VI
Course Name: Automotive mechatronics **Max. Marks** : 100
Course Code: ADEG 343 **Duration** : 3 Hrs
No. of page/s: 2

SECTION A
All questions are compulsory and carry equal marks.

S. No.		Marks	CO
Q 1	Illustrate role of commutator in generator and slip ring in alternator.	5	CO1
Q 2	Elaborate need of voltage regulator. With neat diagram explain working of electromechanically type voltage regulator.	5	CO2
Q 3	Classify various electronics controls unit used in vehicle.	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 analyze classical V model development cycle. Also describe various tool and technology used in V cycle development process.	10	CO3
Q 6	Using appropriate example explain five different types of error handing 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	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.	10	CO4
Q 9	Analyses 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	Design a circuit using electromechanical relay which will drive two different circuits a. To ON DC motor (Motor required 12V DC power supply) b. To ON horn system which requires 24V DC	**10**	**CO4**
Q 10.B	In the below figure assuming motor is power window control motor. Whenever user presses upward switch motor will rotate in clockwise direction and when user presses downward switch motor will rotate in counter clock wise direction. Select appropriate relay for above statement, also design and draw the relay based circuit for below figure. 	**10**	**CO4**
Q 11	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. 1) With respect to graphical representation elucidate CAN bus arbitration process and prove it follows CSMA/CD-CR protocol. 2) Consider node 1 is RPM sensor, node 2 is coolant temperature sensor and node 3 is accelerator pedal position sensor having 64 bit data for transmission, derive and explain Remote frame format and Data frame format considering all necessary bits.	**20 (10+10)**	**CO5**

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SECTION A
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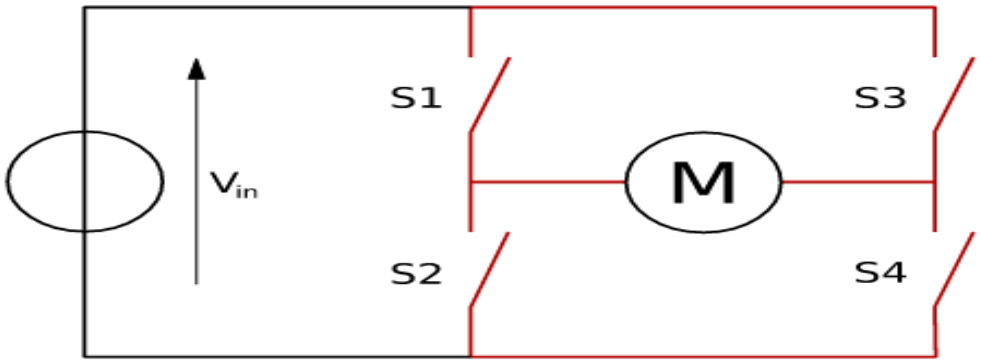
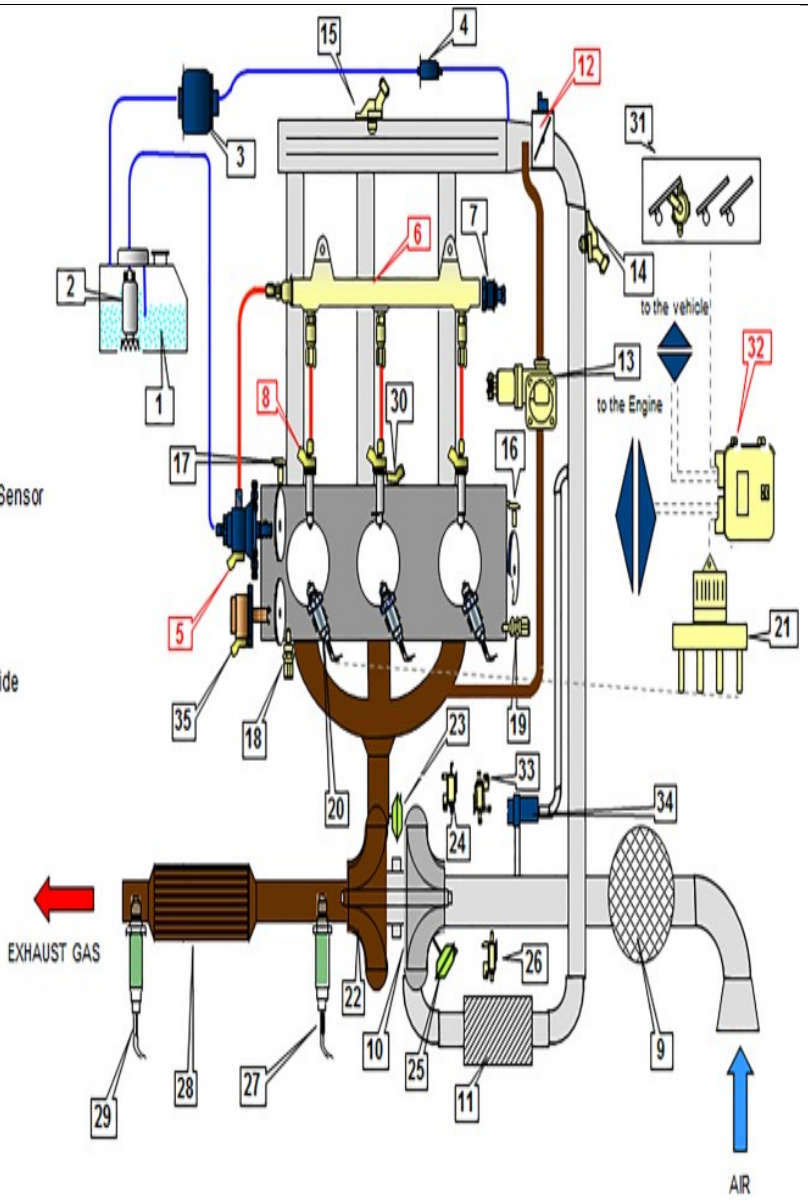
S. No.		Marks	CO
Q 1	Classify engine with respect to injection technology.	**5**	**CO1**
Q 2	Explain need of charging system in the vehicle.	**5**	**CO2**
Q 3	What is ECU in the vehicle? Broadly classify different types of ECU.	**5**	**CO2**
Q 4	Explain hold in coil and pull in coil in starter solenoid.	**5**	**CO3**
	SECTION B **Answer any four questions.**		
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 handing 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	Analyses 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	Design a brake warning light electrical circuit with appropriate electromechanical 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.	**10**	**CO4**

Q 10.B	In the below figure assuming motor is power window control motor. Whenever user presses upward switch motor will rotate in clockwise direction and when user presses downward switch motor will rotate in counter clock wise direction. Select appropriate relay for above statement, also design and draw the relay based circuit for below figure. 	**10**	**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. VVT intake/exhaust actuator



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