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

Program Name:     B. Tech (ADE)                                    Semester :      VI
Course Name : Vehicle Infotronics                            Max. Marks   : 100
Course Code  :        ADEG 443                                   Duration       : 3 Hrs
No. of page/s: 2

## SECTION A
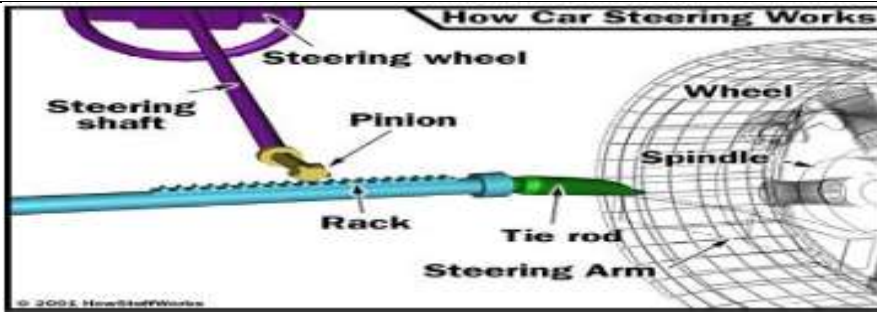### All questions are compulsory and carry equal marks.

| S. No. | | Marks | CO |
|--------|--------------------------------------------------------------------------------|-------|-----|
| Q 1 | Define electronic control unit (ECU) and list out few components of ECU. | 5 | CO1 |
| Q 2 | Explain various market driver factors for automotive industry. | 5 | CO2 |
| Q 3 | Automotive Electrical and Electronic systems are divided into clusters of related functions so called vehicle *domains*. Briefly explain vehicle domain and related system. | 5 | CO2 |
| Q 4 | What is electric defoggers system in vehicle? Explain with appropriate system and circuit diagram. | 5 | CO3 |

## SECTION B
### Answer any four questions.

| | | | |
|------|--------------------------------------------------------------------------------|----|-----|
| Q 5 | Explain automotive embedded software tool chain and list out various automotive grade processor who satisfies/ qualifies stringent IC fabrication guidelines. | 10 | CO3 |
| Q 6 | Using appropriate example explain five different types of error handing mechanism used in CAN bus system. How a single node is becoming error active, error passive and bus off during CAN communication. | 10 | CO4 |
| Q 7 | Explain different radio communication technologies used for vehicle information system.(Use IEEE 802.11p, DSRC, 2-6 GHz frequency and distance up to 100 Km) | 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 | With functional block diagram explain Series Hybrid System which justify popular statement "series hybrid is to couple the ICE with the generator to produce electricity for pure electric propulsion". List out two disadvantages of series hybrid drivetrain. | 10 | CO3 |

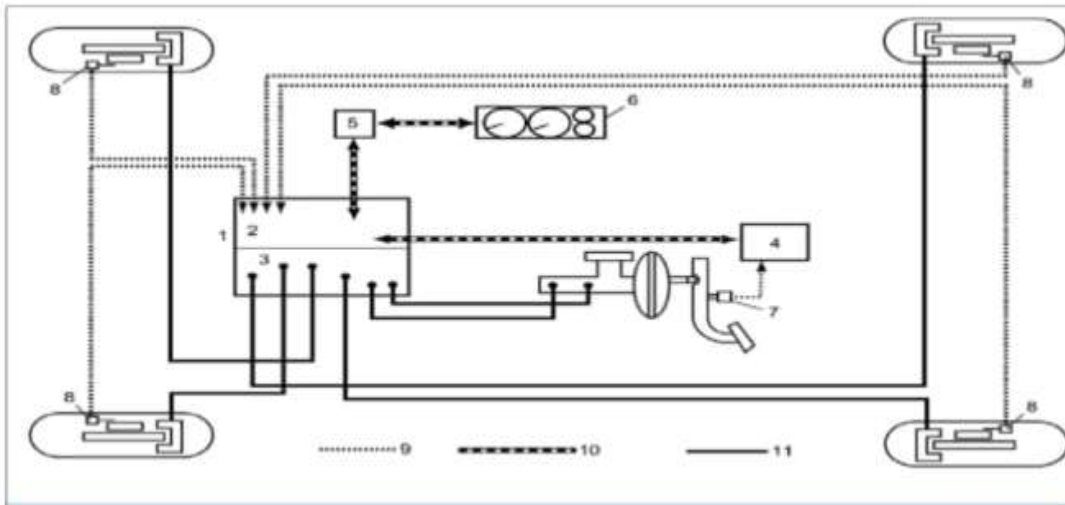| Q 10. | <br>Consider above diagram as steering system.<br>1) Design a hydraulic circuit for steering arrangement considering hydraulic motor as an actuator and use 4/3 DCV both side solenoid operated.<br><br>2) Design a relay based circuit to control electrohydraulic circuit. Assuming three input (STOP, Forward and Reverse) and two outputs (Solenoid1 and Solenoid2) is required to build relay logic.<br><br>3) Design ECU and driver IC based circuit/Block diagram to control electrohydraulic circuit for the development of steer by wire system. ( Select useful sensor input) | **20**<br>**(8+6+6)** | **CO4** |
|---|---|---|---|
| Q 11 | A) 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?<br>B) Consider the below anti-lock braking system block diagram, identify the labeled input starting from 1 to 11 and briefly explain the identified input.<br><br>**OR**<br>Design a hydraulic circuit for antilock braking system considering manual and electronic provision to control hydraulic actuator (use appropriate DCV) and Design a relay based circuit to control electrohydraulic circuit. | **20**<br>**(10+10)** | **CO5** |

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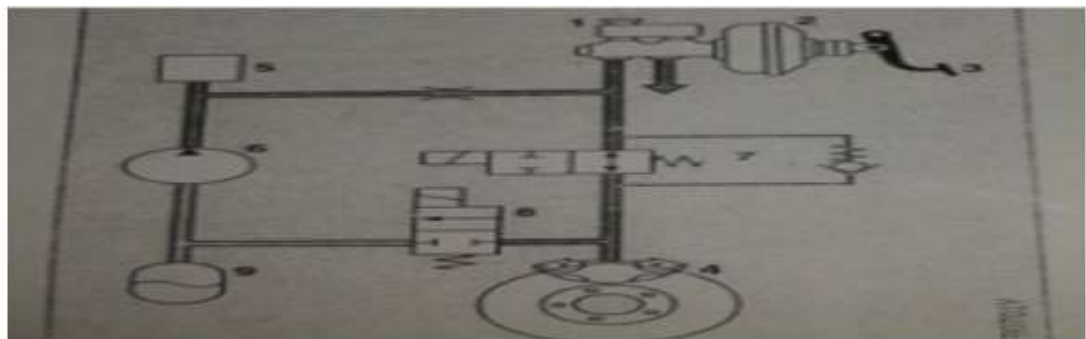
## SECTION A
**All questions are compulsory and carry equal marks.**

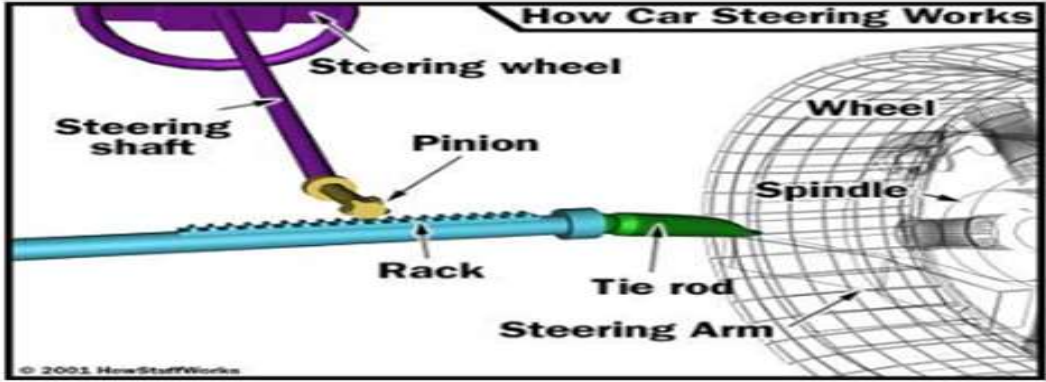| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | Explain IEEE 802.11p with respect to automotive industry. | 5 | CO1 |
| Q 2 | Define ADAS with respect to modern vehicular technology. | 5 | CO2 |
| Q 3 | Describe briefly why legislation has a considerable effect on the development of automotive industry. | 5 | CO2 |
| Q 4 | What is ISO/OSI reference model? Which layer is part of the CAN bus system development process. | 5 | CO3 |

## SECTION B
**Answer any four questions.**

| Q 5 | Explain four frame format i.e. data frame, remote frame, error frame and overload frame used in CAN bus communication protocol. | 10 | CO3 |
|---|---|---|---|
| Q 6 | What is Steer-by-Wire? With near diagram differentiate conventional steering System with Steer-by-Wire System. List out various advantages of Steer-by-Wire. | 10 | CO1 |
| Q 7 | With neat block diagram design electronic stability program (ESP) system. How understeer and oversteer got eliminated in ESP equipped vehicle. | 10 | CO3 |
| Q 8 | Analyze below circuit and explain various components of circuit which is specified by different numbers.  | 10 | CO4 |

| | | | |
|---|---|---|---|
| Q 9 | Explain wire harness system in the vehicle. Why in vehicle networking became popular with respect to wire harness system. List out major advantages with conventional harness system. | 10 | CO3 |

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**SECTION-C**
**Answer any two questions.**

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|---|---|---|---|
| Q 10.A | Design intelligent drive by wire system with appropriate different sensor and actuator. With block diagram explain the drive by wire system. List out advantage and limitations of drive by wire technology. | 10 | CO5 |
| Q 10.B | Illustrate concept of automated guided vehicles. On the basis of technology used for the development AGV explain different types of guiding techniques used in AGV. | 10 | CO5 |
| Q 11.A | Analyse below system and explain various components which replace conventional mechanical system to electronics based steer-by-Wire System.  | 10 | CO4 |
| Q 11.B | Explain Embedded Systems Software Development Process used for system development in automotive industry. Also describe various tool and technology used in V cycle development process. | 10 | CO4 |
| Q 12 | Assume three node want to transmit data through CAN bus and 11 bit or 29 bit identifier for node 1 is 11001011111, node 2 is 11001111000 and node 3 11001011000. With respect to graphical representation elucidate CAN bus arbitration process. Consider node 1, node 2 and node 3 having 32 bit data for transmission derive remote frame format and Data frame format considering SOF, Identifier, Control bit, data bit and CRC bit of remote frame format and Data frame format. | 20 | CO5 |