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| Course Code and Title: **23EEEC303/ Automotive Electronics** | |
| **UNIT II:** | Planned Hours: **4 hrs** |

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| 1 | Discuss the physical mechanism of wheel lock and vehicle skid that can occur during braking; How the ABS configuration provides a solution for this.  If the vehicle longitudinal acceleration is zero,  i) Calculate the wheel slip if vehicle speed is matching with wheel speed?  ii)Calculate wheel slip for Fl(Front left) and Fr(Front right), when vehicle speed is 70kph and WssFl(Wheel speed front left) and WssFr(Wheel speed front right) are reading 58 kph and 68 kph respectively  iii) Calculate wheel slip when panic braking is done at 150kph and ABS is shut down due to pump failure? |
| 2 | Answer the following with respect to FlexRay communication protocol.   1. Bus Level 2. Bus Guardian   Communication Cycle |
| 3 | What is ride and handling of an automobile? How electronic suspension system manages the compromise between ride comfort and handling? |
| 4 | Compare event driven and time triggered communication strategies. Calculate nominal and maximum THeader , TResponse and TFrame, if LIN is operating at 10 Kbps baud rate and reserved time is set to 30% for transmitting four bytes of data. |
| 5 | Answer the following with respect to CAN communication  i) The CAN node receives the message as 1011110, state whether the received information is error free or not. Assume CRC with a generator polynomial as 1011.  ii) How small nodes can be kept from overloading with received messages  iii) Message prioritization in case of CAN protocol.  iv) Draw the message sequence seen by the CAN bus for the given scenario.  C:\Users\giree\Desktop\New Microsoft PowerPoint Presentation21.jpg |
| 6 | The fast moving car is turning at the corner, if the vehicle is turning less/more than the driver’s intention suggest a suitable control system along with the break circuit configuration to overcome this condition |
| 7 | Assume that the driver has activated the cruise control switch set for the desired speed of (say, 60 mph). For the following conditions determine the action of throttle controlled by the suitable control algorithm;  i) If the car is travelling on a level road  ii) If the car is then to enter a long hill with a steady positive slope (i.e. a hill going up). |
| 8 | What is ride and handling of an automobile? Provide an electronic solution managing these conditions. |
| 9 | Describe the physical reasons why a car could skid or experience wheel lock when braking. Also, discuss the best wheel lock prevention control method.  i) Calculate the wheel slip if vehicle speed is matching with  wheel speed?  ii)Calculate wheel slip for Fl(Front left) and Fr(Front right), for which the wheel rpm is measured as 2000 rpm and 2200 rpm with wheel radius as 0.3 m, when vehicle speed is 68 kph.  iii) Calculate wheel slip when panic braking is done at 150kph and ABS is shut down due to pump failure? |
| 10 | What are the individual channels of MOST and what kind of information is transported therein? What is the coding technique used in MOST Physical layer? Determine how the data 10100111001 is transmitted. |
| 11 | Assume that the driver has activated the cruise control switch set for the desired speed of (say, 60 mph). For the following conditions, determine the action of throttle controlled by the suitable control algorithm;  i) If the car is travelling on a level road  ii) If the car is then to enter a long hill with a steady positive slope (i.e. a hill going up). |
| 12 | For the Communication schedule shown below, draw the  i) FlexRay cluster and  ii) Respective communication cycle. |
| 13 | Compare the two communication strategies, event-driven and time-triggered. Explain to the scenario how Flexray combines these two techniques into a single protocol. |
| 14 | Calculate nominal and maximum T Header, T Response, and T Frame, if LIN is operating at 10 Kbps baud rate and reserved time is set to 30% for transmitting four bytes of data. |
| 15 | Answer the following with respect to CAN communication  i)Difference between classical CAN and CAN FD  ii)Message prioritization in case of CAN protocol  iii)What solution CAN protocol offers for Long NRZ messages  iv) Propose the acceptance filter for a CAN controller to receive messages with IDs  0x441, 0x445 0x451, 0x455, 0x541,0x545,0x551, and 0x551 |
| 16 | What do you mean by over steering and under steering, with the necessary flow diagram how electronic stability program (ESP) counteracts the over steering and understanding condition? |
| 17 | With the necessary speed response plots discuss the role of for PI controllers for cruise control system. |
| 18 | Discuss the physical mechanism of wheel lock and vehicle skid that can occur during braking; how the ABS configuration provides a solution for this. Calculate the slip in percentage if the car is travelling at the speed of 60mph, with a wheel radius of 16 inches and if the wheel speed sensor is reading 2000 rpm |
| 19 | How can you improve the efficiency/performance /reliability of engine control unit by adding any extra sensors for the existing system? Mention the significance of sensors and related variables to be measured for engine control system. |
| 20 | What solution CAN protocol offers for long NRZ messages? What are the limitations of that solution? |
| 21 | The CAN node has to transmit the message 11101, show how this message is transmitted, and explain how the CAN receiver node determines whether the message is error free or not. (Assume CRC of CAN uses (7,4) CRC with the generator polynomial as 1011). |
| 22 | Explain the difference between active and passive safety system. |
| 23 | Why traction control is necessary in automobiles? Suggest an electronic solution of Driving Dynamic control system. |
| 24 | Describe the working of Electronic suspension system, Electronic power steering systems. |
| 25 | Imagine you are travelling on a modern vehicle, stopped the vehicle at the signal and switched to neutral gear, but co-travelers insisted to switch on the AC but vehicle is at idle rpm of 800, will this rpm be sufficient to drive the demanded load, if not how is handled by the e engine management system. |
| 26 | How performance is enhanced for TCS with an additional sensor input along with conventional wheel speed sensor input. Justify your answer the representative block diagram. |