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VI Semester B.E. Examination
(Electronics and Communication Engineering)
Automotive Electronics (22EECC305/22EEIC316)

Duration: 3 hours **Max. Marks: 100**

Note: ***i)*** *Answer any TWO full questions from UNIT-I, any TWO full questions from UNIT-II and any ONE full question from UNIT-III.*

UNIT-I

1	a.	What do you mean by engine mapping? The engine operating in closed loop mode, how the variations in exhaust gas re circulation, air fuel ratio and ignition timing affects performance of an engine. Show with the necessary plots.	(08marks)
	b.	Explain the construction and working principle of digital mass air flow rate sensor.	(06marks)
	c.	Explain the MBD approach adhering to automotive V-design model for the development of an engine ECU.	(06marks)
2	a.	Describe the role of TWC in engine control system with block diagram and analyze the conversion efficiency with respect to variation in the air fuel ratio and temperature.	(08marks)
	b.	Suggest and explain the sensor used for closed loop operation of an engine control system to maintain the air/fuel ratio.	(06marks)
	c.	What are the legal requirements governing automotive air pollutants released into the atmosphere? Discuss the impact in terms of Indian and global standards.	(06marks)
3	a.	Imagine the vehicle is running at a fixed rpm of 8000 and further the driver demands for increase the speed. How the engine ECU handles drivers request using ignition timing? Suggest a suitable control system for closed loop control system for close loop control of ignition timing.	(08marks)
	b.	Explain automotive supply chain and value chain.	(06marks)
	c.	What is stoichiometric ratio? Calculate Lambda, if air/fuel ratio is 12.2. Derive the expression for determining fuel quantity and fuel injector pulse duration for open loop control mode.	(06marks)
4	a.	Describe the control system, which provides a solution for wheel spinning and discuss the related control functions.	(08marks)
	b.	Calculate nominal and maximum T_{HEADER}, $T_{RESPONSE}$ and T_{FRAME}, if LIN protocol is operating at 10 kbps baud rate and reserved time is set to 30% for transmitting four bytes of data.	(06marks)
	c.	Explain the frame format of CAN-FD protocol.	(06marks)
5	a.	What do you mean by over steering and under steering with necessary brake circuit configuration. Demonstrate how ESP counteracts the over steering and under steering condition?	(08marks)
	b.	Explain the frame format of MOST-25 protocol.	(06marks)
	c.	Explain the organization of the LIN schedule.	(06marks)
6	a.	Explain the following with respect to CAN communication protocol i) Message prioritization	(08marks)

ii) Acceptance filter

iii) The CAN node receives the message as 1011110. Detect whwther the received information is error free or not. Assume CRC with a generator polynomial as 1011.

b. Discuss the physical mechanism of wheel lock and vehicle skid that can occur duroing braking. Also discuss the suitable control system, which provides solution for wheel lock. (06marks)

c. Explain the following with respect to FlexRay communication protocol

i) Physical signal transmission

ii) Flexray cluster

iii) Static and dynamic segment (06marks)

UNIT-III

7 a. Assume that the driver has activated the cruise control switch for the desired speed of 70 kmph. Explain the suitable control algorithm for the following conditions

i)If the car traveling on a level road

ii)If the car is traveling on a positive slope road. (08marks)

b. Propose the ADAS architecture and solution for sign board recognition system. (06marks)

c. An OEM defines an item as TCS, the system, which avoids wheel spinning. Perform hazard analysis and risk assessement in terms of ASIL. (06marks)

8 a. During the cold cranking the air/fuel ratio is not able to be controlled, list the possible faults. (08marks)

b. Discuss the objectives of off-board diagnostics. (06marks)

c. Discuss the features of diagnostic protocol KWP2000. (06marks)