

Name:

Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

**End Semester Examination, July 2020**

**Programme: B. Tech (Mechatronics Engineering )**

**Semester : VI**

**Course Name: Automotive Mechatronics**

**Max. Marks : 100**

**Course Code: MECH 3017**

**Duration : 3 Hrs**

**No. of page/s: 6**

1. Read the instruction carefully before attempting.
2. This question paper has two section, Section A and Section B.
3. There are total of six questions in this question paper. **One** in **Section A** and **five** in **Section B**
4. **Section A** consist of multiple choice based questions and has the total weightage of 25%.
5. **Section A** will be conducted online on BB Collaborate platform
6. **Section B** consist of long answer based questions and has the total weightage of 75%. The questions for section B shall also appear in BB Collaborate
7. The maximum time allocated to **Section A** is one Hrs.
8. **Section B** to be submitted within 24 hrs from the scheduled time (*exceptional provision due extraordinary circumstance due to COVID-19 and due to internet connectivity issues in the far-flung areas*).
9. No submission of **Section B** shall be entertained after 24 Hrs.
10. **Section B** should be attempted after **Section A**
11. **The section B** should be attempted in blank white sheets (hand written) with all the details like programme, semester, course name, course code, name of the student, Sapid at the top (as in the format) and signature at the bottom (right hand side bottom corner)
12. Both section A & B have questions from entire syllabus.

**SECTION A**

**All questions are compulsory and carry equal marks (25\*1 = 25 Marks)**

S. No.		Marks	CO
Q 1	<p>1. Three types of temperature transducer are compared as regards their sensitivity. The order in which they exhibit their sensitivity highest to lowest is</p> <ol style="list-style-type: none"> <li>RTD, Thermocouple, Thermister</li> <li>Thermister, RTD, Thermocouple</li> <li>Thermister Thermocouple RTD</li> <li>All Having Same Sensitivity</li> </ol> <p>2. If battery giving excessive gassing and temperature</p> <ol style="list-style-type: none"> <li>undercharge</li> <li>Overcharge</li> <li>Zero charge</li> <li>None</li> </ol> <p>3. The electrolyte for a fully charged lead acid battery has a relative density of</p> <ol style="list-style-type: none"> <li>one</li> <li>One point one</li> <li>one point two eight</li> <li>One point four two</li> </ol> <p>4. What does an actuator do?</p> <ol style="list-style-type: none"> <li>it is an input device for an engine control system</li> <li>it provides a mathematical model for an engine</li> <li>it causes an action to be performed in response to an electrical signal</li> <li>it indicates the results of a measurement</li> </ol> <p>5. The crankshaft angular position sensor measures.</p> <ol style="list-style-type: none"> <li>the angle between the connecting rods and the crankshaft</li> <li>the angle between a line drawn through the crankshaft axis and a mark on the flywheel and a reference line</li> <li>the pitch angle of the crankshaft</li> <li>the oil pressure angle</li> </ol> <p>6. Duty cycle in a fuel injector actuator refers to the ratio of.</p> <ol style="list-style-type: none"> <li>fuel on time to fuel off time</li> <li>fuel off time to fuel on time</li> <li>fuel on time to fuel on time plus fuel off time</li> <li>none of the above</li> </ol> <p>7. Maximum Power is transmitted by an electrical transducer if the impedance of the external load.</p> <ol style="list-style-type: none"> <li>is very low</li> <li>Is very high</li> <li>matches with the internal impedance of the transducer</li> <li>increases from very low to very high values</li> </ol> <p>8. The most common transducer for shock and vibration measurement is</p>	<p align="center"><b>25*1 = 25</b></p>	<p align="center"><b>5Q CO1</b></p> <p align="center"><b>5Q CO2</b></p> <p align="center"><b>5Q CO3</b></p> <p align="center"><b>5Q CO4</b></p> <p align="center"><b>5Q CO5</b></p>

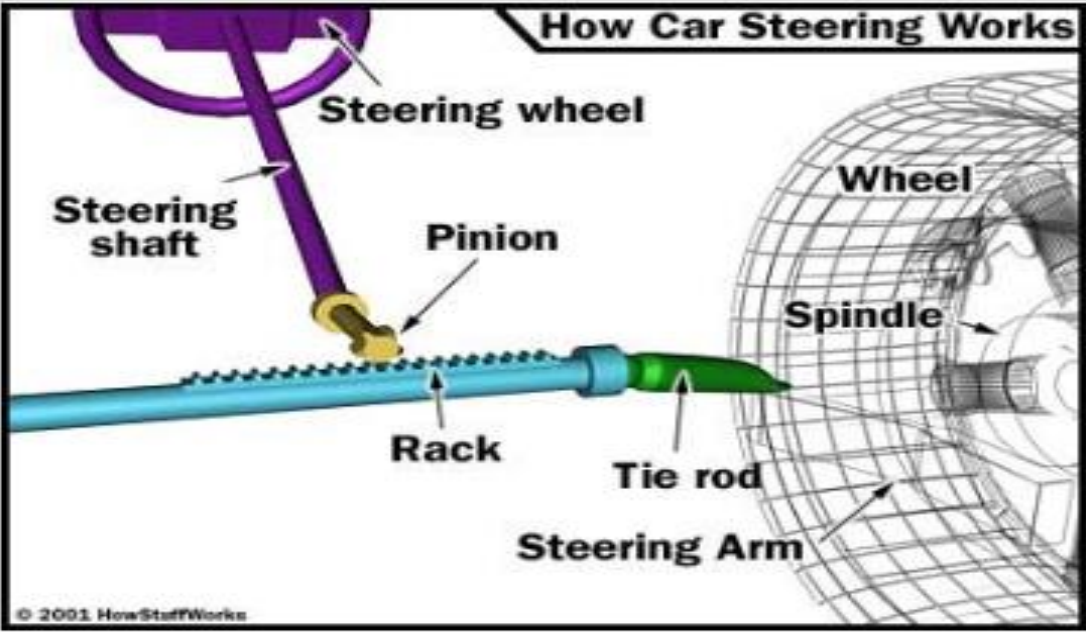
	<ul style="list-style-type: none"><li>a. dial gauge</li><li>b. Ring type load cell</li><li>c. LVDT</li><li>d. piezoelectric sensor</li></ul> <p>9. Alternating current in an alternator is rectified by</p> <ul style="list-style-type: none"><li>a. Brushes</li><li>b. Diodes</li><li>c. Slip rings</li><li>d. Transistors</li></ul> <p>10. A typical automotive alternator has how many poles?</p> <ul style="list-style-type: none"><li>a. 2 to 4</li><li>b. 6 to 8</li><li>c. 8 to 14</li><li>d. 12 to 20</li></ul> <p>11. Alternator output voltage is directly related to:</p> <ul style="list-style-type: none"><li>a. Field strength</li><li>b. Rotor speed</li><li>c. Both field strength and rotor speed</li><li>d. Neither field strength nor rotor speed</li></ul> <p>12. Which of the following is used to monitor the charging system?</p> <ul style="list-style-type: none"><li>a. Ammeter</li><li>b. Ohmmeter</li><li>c. Dynamometer</li><li>d. Fusible link</li></ul> <p>13. Which of the following is not part of the starter control circuit?</p> <ul style="list-style-type: none"><li>a. The ignition switch</li><li>b. The starting safety switch</li><li>c. The starter relay</li><li>d. The starter motor</li></ul> <p>14. The starting safety switch is also called a</p> <ul style="list-style-type: none"><li>a. Remote-operated switch</li><li>b. Manual-override switch</li><li>c. Neutral-start switch</li><li>d. Single-pole, double-throw switch</li></ul> <p>15. Which of the following is true of a shunt motor?</p> <ul style="list-style-type: none"><li>a. It has high initial torque.</li><li>b. It operates at variable speed.</li><li>c. It has only one path for current flow.</li><li>d. It is not often used as a starting motor.</li></ul> <p>16. The ratio between the number of teeth on the flywheel and the motor pinion gear is about:</p> <ul style="list-style-type: none"><li>a. 1 is to 1</li><li>b. 5 is to 1</li></ul>		
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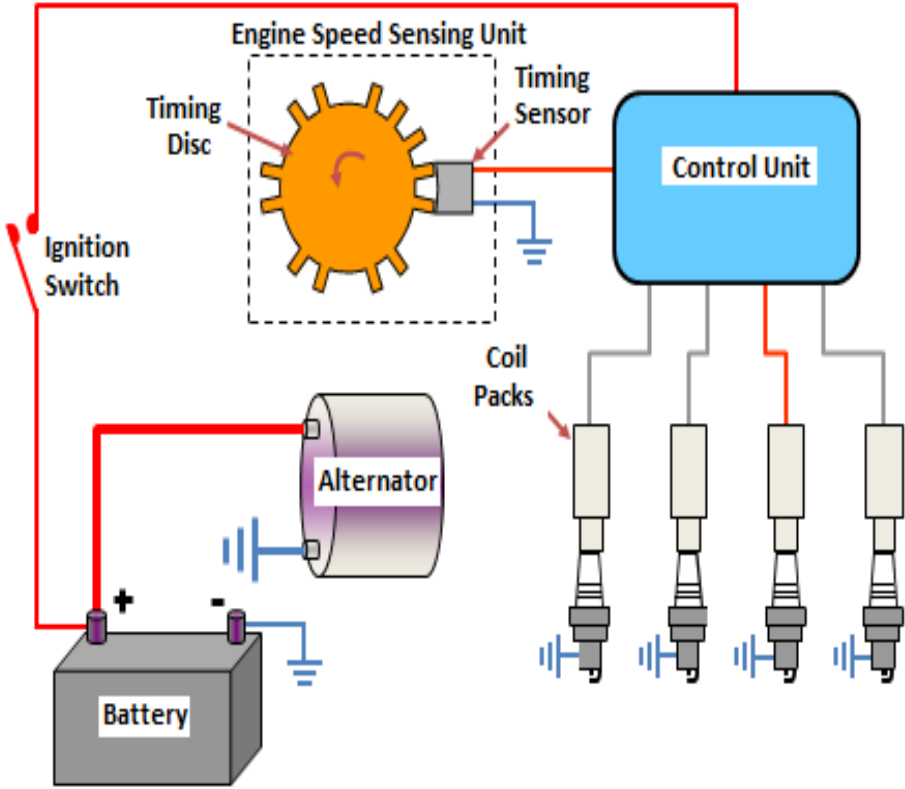
	<p>c. 20 is to 1 d. 50 is to 1</p> <p>17. A starter solenoid uses two coils. Their windings are called:</p> <ul style="list-style-type: none"><li>a. Push-in and pull-out</li><li>b. Pull-in and push-out</li><li>c. Push-in and hold-out</li><li>d. Pull-in and hold-in</li></ul> <p>18. Voltage induced in the secondary winding of the ignition coil is how many times greater than the self induced primary voltage?</p> <ul style="list-style-type: none"><li>a. 1 to 2</li><li>b. "10 to 20"</li><li>c. 100 to 200</li><li>d. 1,000 to 2,000</li></ul> <p>19. With respect to OBD a fault code is</p> <ul style="list-style-type: none"><li>a. a numerical indication of failure in certain specific engine components</li><li>b. displayed to the mechanic during diagnostic mode</li><li>c. registered in memory whenever a failure in a component occurs</li><li>d. all of the above</li></ul> <p>20. The Hall Effect is</p> <ul style="list-style-type: none"><li>a. The resonance of a long, narrow corridor</li><li>b. The flow of air through the intake manifold</li><li>c. Zero crossing error in camshaft position measurements</li><li>d. A phenomenon occurring in semiconductor materials in which a voltage is generated that is proportional to the strength of a magnetic field</li></ul> <p>21. A pair of active transducers is</p> <ul style="list-style-type: none"><li>a. Thermocouple, thermistors</li><li>b. Thermistors, solar cell</li><li>c. Solar cell, LVDT</li><li>d. Thermocouple, solar cell</li></ul> <p>22. V Model development cycle is</p> <ul style="list-style-type: none"><li>a. A software development model that illustrates how testing activities integrate with software development phases</li><li>b. A software life cycle model that is not relevant for testing</li><li>c. The official software development and testing life cycle model of ISTQB</li><li>d. A testing life cycle model including unit, integration, system and acceptance phases</li></ul> <p>23. What is KWP2000?</p> <ul style="list-style-type: none"><li>a. In vehicle networking protocol</li><li>b. Verification and Validation (V&amp;V) process tool</li><li>c. Diagnostic communications standard</li><li>d. Interrupt techniques</li></ul>		
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	<p>24. What is the speed of CAN?</p> <ul style="list-style-type: none"> <li>a. 1 meter, 10Kbps</li> <li>b. 100 meter, 5Mbps</li> <li>c. 1Km, 1Mbps</li> <li>d. 40m, 1Mbps</li> </ul> <p>25. CAN logic what it follows?</p> <ul style="list-style-type: none"> <li>a. Wired AND logic</li> <li>b. Wired OR logic</li> <li>c. Wired Ex OR logic</li> <li>d. Wired NOT logic</li> </ul>		
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**SECTION B**

**All questions are compulsory and carry equal marks (15\* 5 = 75 Marks)**

Q 2	<p>Explain Block Diagram of ETC. Illustrate with suitable reasons why electronic throttle actuation is preferable to a conventional throttle cable system.</p>	15	CO3
Q 3	<p>Explain with block diagram steer by wire system and explain different sensor and actuators used in the system. Consider the below diagram which is conventional rack and pinion mechanism. Think and propose others methods as a replacement of rack and pinion arrangement and provide design parameters of one system.</p> 	15	CO4
Q 4	<p>Using appropriate example explain five different types of error handling mechanism used in CAN bus system.</p>	15	CO5

Q 5	Explain different tools used in V cycle model with neat diagram. Justify the statement that it is used for large scale and complex automotive systems.	15	CO2
Q 6	<p>Analyze why in the vehicle, alternator prefers with respect with DC generator? Describe with the help of neat diagram the construction and working details of alternator.</p> <p style="text-align: center;"><b>OR</b></p> <p>Consider the below electronic ignition system, it consists of engine speed sensor, timing unit, control unit, Ignition switch, battery etc. With Facts and neat diagram, explain role of each component and why this system is preferred over conventional ignition system.</p> <div style="text-align: center;">  <p style="text-align: center;"><b>IGNITION SYSTEM – Electronic Systems</b></p> </div>	15	CO1