Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **18ME3028** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED INSTRUMENTATION IN**  **THERMAL ENGINEERING** | **Max. marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | What is correlation coefficient? | CO1 | 4 |
| b. | The following data are taken from a certain heat-transfer test. The expected correlation equation is y = axb. Plot the data in an appropriate manner and use the method of least squares to obtain the best correlation.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | x | 2040 | 2580 | 2980 | 3220 | 3870 | 1690 | 2130 | 2420 | | y | 33.2 | 32.0 | 42.7 | 57.8 | 126.0 | 17.4 | 21.4 | 27.8 |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | x | 2900 | 3310 | 1020 | 1240 | 1360 | 1710 | 2070 | | y | 52.1 | 43.1 | 18.8 | 19.2 | 15.1 | 12.9 | 78.5 |   Calculate the mean deviation of these data from the best correlation. | CO2 | 12 |
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| 2. | a. | What are some advantages of the bourdon-tube, diaphragm, and bellows gages? | CO3 | 6 |
| b. | Describe the measurement of temperature using optical pyrometer with neat diagram. | CO3 | 10 |
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| 3. | a. | How are thermal conductivities of metals measured? | CO3 | 4 |
| b. | What is the utility of the hot-wire anemometer? | CO3 | 6 |
| c. | A Sayboltviscosimeter is used to measure the viscosity of an oil having ν = 50 centistokes. To what uncertainty must the drainage time be determined so that ν is measured within ±1 percent? | CO3 | 6 |
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| 4. | a. | An car manufacturer claims that his car will consume 1 l of petrol in covering a distance of 18 km. The petrol used is known to produce 2.12 kg of CO per l. What is the emission level of this car? Will it meet the European Union (EU) requirement of 95 g/km in 2020? What should be the performance value that will satisfy this? | CO3 | 4 |
| b. | What are the methods available for measurement of gas concentration? Explain in detail about Non Dispersive Infrared Analyzer(NDIR). | CO3 | 12 |
|  |  |  |  |  |
| 5. | a. | What are the radition properties of a surface and list out the measurement methods? | CO4 | 6 |
| b. | Explain in detail about emmisivity measurement using hemispherical emissivity method. | CO4 | 10 |
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| 6. | a. | What is specific heat capacity of fuel? | CO4 | 4 |
| b. | Explain in detail about the measurement of specific heat capacity of liquids. | CO4 | 12 |
|  |  |  |  |  |
| 7. | a. | What are the major elements of a data acquisition and processing system? | CO5 | 6 |
|  | b. | An A/D converter is to be designed for a special instrument that will accommodate type N thermocouples operating over the range of 0 to 1000◦C. A resolution of 0.5 ◦C at 25 ◦C is desired. Determine the number of bits required and the maximum voltage operating range. [Use of thermal emf in absolute millivolts for commonly used thermocouple combinations, according to ITS(90)]. | CO5 | 10 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | How experiments are categorized and list out all the applicable characteristics of experiments. | CO6 | 10 |
| b. | Explain I detail about experimental design protocol and examples. | CO6 | 10 |