Register Number:……..

KUMARAGURU
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GENERAL INSTRUCTIONS TO THE CANDIDATES

1. Candidates are instructed to answer the questions as per Bloom's Taxonomy knowledge level (K_1 to K_6)
2. Candidates are strictly instructed not to write anything in the question paper other than their roll number.
3. Candidates should search their pockets, desks and benches and handover to the Hall Superintendent/ Invigilator if any paper, book or note which they may find therein as soon as they enter the examination hall.
4. Candidates are not permitted to bring electronic watches with memory, laptop computers, personal systems, walkie-talkie sets, paging devices, mobile phones, cameras, recording systems or any other gadget / device /object that would be of unfair assistance to him / her.
5. Corrective measures as per KCT examination policies will be imposed for malpractice in the hall like copying from any papers, books or notes and attempting to elicit the answer from neighbours.

B.E DEGREE EXAMINATIONS: DEC 2015

(Regulation 2014)

Third Semester

MECHATRONICS ENGINEERING

U14MCT301: Sensors And Instrumentation

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-
PART A (10 x 1 = 10 Marks)

1. Sequence the elements of a measurement systems CO1 [K_2]
   A. A/D converter
   B. Sensing element
   C. Filter
   D. Amplifier
   a) B, A,C,D b) B, C, D, A
   c) B, C, A, D d) B, D, C, A

2. Sequence the temperature sensors as a function of linearity (high to low) CO3 [K_1]
   A. Thermocouple
   B. Thermistor
   C. IC sensor
   D. RTD
   a) A, B,C,D b) A, D, C, B

c) A, B, D, C d) A, D, B, C

3. Sequence the strain measuring sensors based on their sensitivity (high to low) CO4 [K_1]
   A. Resistive type
   B. Semiconductor type
   C. Fiber optic type
   D. Piezo electric type

a) A, B, D, C b) C, B, D, A

c) C, B, A, D d) B, C, D, A

4. R-2R ladder network is a --- [K_1]

a) Multiplexer b) De multiplexer

c) Analog to digital converter d) Digital to Analog converter

5. ----- is not working in the principle of change in resistance CO1 [K_2]

a) Ultrasound sensor b) Humidity sensor

c) Level sensor d) Temperature sensor

6. **Statement A**: Change in resistance is the only method used for both linear and angular measurements. CO3 [K_2]

   Statement B: Change in resistance, inductance and capacitance are can be used for both linear and angular displacement measurement.

a) Statement A is correct and B is incorrect b) Statement B is correct statement A is incorrect

c) Both statement A and statement B are correct statement A is correct explanation for statement B d) Both statement A and statement B are correct statement A is incorrect explanation for statement B

7. Statement A : 4-20 mA is a standard current loop used in industrial communication. CO8 [K_2]

   Statement B: 3-15psi is a standard pressure loop used in industrial communication along with current loop.

a) Statement A is correct and B is incorrect b) Statement B is correct statement A is incorrect

c) Both statement A and statement B are correct, statement A is correct explanation for statement B d) Both statement A and statement B are correct , statement A is incorrect explanation for statement B

8. Statement A : Resistive type strain gauges are not affected by temperature . CO4 [K_1]
   Statement B: Dummy gauges are needed to compensate the temperature

a) Statement A is correct and B is incorrect b) Statement B is correct statement A is incorrect

c) Both statement A and statement B are correct, statement A is correct explanation for statement B d) Both statement A and statement B are incorrect.

9. Statement A: Sound power cannot be measured. CO5 [K_1]
Statement B : Sound pressure can be measured and sound power can be calculated from sound pressure.

a) Both statements A and statement B are correct
b) Both Statements A and B are incorrect
c) Statement A is incorrect, statement B is correct
d) Both statements A and statement B are correct, statement B is the correct explanation to statement A.

10. [K_1] CO1

List I	List II
A. Hygrometer	i. Measures sound in water
B. Hot wire Anemometer	ii. Measures air velocity
C. Pyrometer	iii. Measures RH
D. Hydrophones	iv. Measures temperature

	A	B	C	D
a)	i	iv	ii	iii
b)	iii	iv	ii	i
c)	iii	ii	i	iv
d)	iii	ii	iv	i

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11. A voltmeter can measure a voltage between 0-10V, which indicates the following reading 5, 5.5, 6, 4, 4.5, 7, 5, 5.5,.Calculate the standard deviation of the equipment. CO2 [K_3]

12. Give expression for impulse signal and justify its requirement in sensors? CO2 [K_3]

13. Justify, why RTD need compensation circuit and how it is achieved? CO3 [K_4]

14. When capacitance type hygrometer is preferred over resistance type.? CO4 [K_2]

15. In a cantilever beam, why strain gauges are fixed near to the fixed end? CO4 [K_3]

16. Classify microphones based on directionality. CO5 [K_2]

17. Differentiate CT from PT. CO6 [K_2]

18. Define Power factor and its range. Why it should be always high?. CO6 [K_2]

19.	Define “role of rate” in filters? And what is its significance?		CO7	[K_4]
20.	Draw the circuit diagram of a non-inverting amplifier and why it is not preferred as compared to inverting?		CO8	[K_3]

Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	Describe various static and dynamic characteristics of measurement system and also explain various errors encountered during measurement.		CO2	[K_2]
22.	Derive equations for inductive and capacitive type sensors and with an example, explain how inductive principle is used in the measurement of velocity.		CO3	[K_2]
23.	A nuclear reactor needs less than .1Pa. As it is familiar using very common materials in the reactor is difficult. As a mechatronic engineer, a task has been given to you select an appropriate sensor for this condition. How do you select a suitable sensor and justify your answer with construction.		CO3	[K_4]
24.	Justify why CT and PT are required in the measurement of electrical quantities?. Explain the construction and operation of any three CT.		CO6	[K_2]
25.	Instrumentation amplifier is commonly used in measurement systems. Justify your answer with circuit, equation and operation.		CO7	[K_3]
26.	i) Describe various communication systems used in industrial environment	(7)	CO8	[K_2]
	ii) Explain various filtering systems used in data acquisition systems.	(7)	CO8	[K_2]

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