Register Number:……..

KUMARAGURU
college of technology
character is life

B.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Fourth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U15EET404**:** Measurements and Instrumentation

COURSE OUTCOMES

CO1: Explain the functional elements of instruments used for measuring electrical parameters.
CO2: Determine the circuit parameters (R,L,C and frequency) using bridges
CO3: Explain the function and working of various transducers for measuring physical quantities.
CO4: Illustrate the concept of digital measurement system.
CO5: Describe the role of intelligent sensors and data acquisition system for effective measurement and data storage.
CO6: Select appropriate instruments for measuring electrical and non electrical parameters.

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Match each of the category in list 1 with instrument in list 2 CO1 [K_2]

List 1	List 2
A. PMMC meter	1. Wattmeter
B. Moving Iron meter	2. DC Voltmeter
C. Electrodynamometer type	3. Energy meter
D. Induction type	4. DC & AC Voltmeter

a) A-4 B-2 C-3 D-1 b) A-4 B-2 C-1 D-3

c) A-2 B-4 C-3 D-1 d) A-2 B-4 C-1 D-3

2. Which of the following statements is/are not correct? CO1 [K_2]

1. It is not possible to have precise measurements which are not accurate.
2. Correctness in measurement requires any one either accuracy or precision
3. Reproducibility and consistency are expressions that describe precision in measurement.
4. An instrument with 5% accuracy is better than another with 2% accuracy

a) Only 4 b) 1,3

c) 1,4 d) Only 3

3. Which of the following is used to accurately measure resistance of less than 1Ω? CO6 [K_1]

a) Wheatstone bridge b) Kelvin bridge

c) Meggar d) Anderson bridge

4. Match the resistance of Column A with corresponding bridges of column B CO2 [K_2]

Column A	Column B
A. Frequency	1. Maxwell Bridge
B. Capacitance	2. Wein Bridge
C. Inductance of wide range Q values with ease of balancing	3. Schering Bridge
D. Inductance of Q values in the range 1-10	4. Anderson bridge

a) A-2 B-3 C-1 D-4 b) A-3 B-2 C-1 D-4

c) A-2 B-3 C-4 D-1 d) A-3 B-2 C-4 D-1

5. Sequence following operation in digital voltmeter: 1.Rectification and filtering 2. Data display and recorder 3. Analog to digital conversion 4. Attenuation CO4 [K_2]

a) 1-3-2-4 b) 1-3-4-2

c) 4-3-2-1 d) 4-1-3-2

6. The resolution of digital meter is increased by CO4 [K_1]

a) Increasing number of bits in A/D b) Employing fast sample and Hold circuit

c) Increasing amplitude of A/D d) Increasing Sampling frequency

7. Appropriate sequence of process involved in measurement of temperature using RTD are CO3 [K_2]

1. Resistance increases with increase in temperature
2. Resistance decreases with increase in temperature
3. Measurement of resistance using wheat stone bridge
4. Resistance is transmitted through leads that are protected by sheath
5. Temperature of the element under measurement varies.

a) 5-1-3-4 b) 5-1-4-3

c) 5-2-3-4 d) 5-2-4-3

8. **Assertion (A):** Thermocouples can work at much higher temperatures than thermistors CO3 [K_2]

Reason (R): Thermocouple is a passive device and it only measures relative temperature.

a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false d) A is false but R is true

9. **Assertion(A):** Analog data acquisition system is preferred for narrow bandwidth applications CO5 [K_2]
Reason (R): Analog data acquisition system generally reduces the accuracy of the system

a) Both A and R are Individually true and R is the correct explanation of A
b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false
d) A is false but R is true

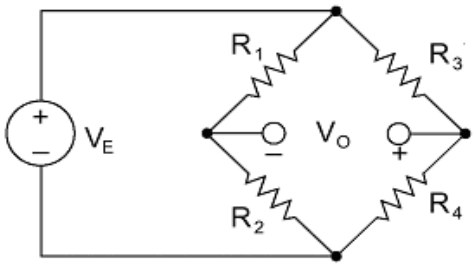
10. In smart grid a house equipped with solar PV system need to compute the electric energy injected into the grid and it also compute the energy drawn from the grid when no power is available from solar. The energy meter with inbuilt cost calculator need to be CO6 [K_4]

a) recording instrument
b) integrating instrument
c) indicating Instrument
d) Secondary instrument

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. Differentiate Moving coil and Moving iron instruments. CO1 [K_2]
12. Define accuracy and precision with regard to measurements. CO1 [K_1]
13. What are the problems associated with measurement of very low resistance? How to overcome it by employing suitable bridge? CO2 [K_2]
14. Compute Resistance R4 of a wheat stone bridge under balanced condition R1=80Ω R2=120 Ω R3=480 Ω CO2 [K_2]



15. List out any four applications of power analyzer. CO4 [K_1]
16. What are the key elements of a digital frequency meter? CO4 [K_1]
17. Why are thermistors preferred for temperature measurement in the lower temperature regime? CO6 [K_3]
18. What are the advantages of fibre optic transducer? CO3 [K_2]
19. Justify why multiplexing is necessary and mention the two ways of accomplishing multiplexing in data acquisition system. CO5 [K_3]
20. Mention the applications of nano sensor. CO5 [K_1]

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

Q.No. 21 is Compulsory

21.	(i) Explain with the circuit the operation of dc voltmeter using a PMMC instrument. Derive the torque equation for a PMMC instrument and prove that its scale is linear.	(10)	CO1	[K_2]
	(ii) Explain the following terms in precision measurements (a) Sensitivity (b) drift (c) dead zone (d) time lag	(4)		
22.	Explain the construction and working of induction type energy meter. Mention its merits and demerits.		CO1	[K_1]
23.	Derive the expression for unknown capacitance using Schering bridge. Illustrate the procedure in detail and state its advantages and disadvantages.		CO2	[K_2]
24.	Describe the construction and working of LVDT with neat sketches. Explain its output characteristics with an example.		CO3	[K_2]
25.	(i) Describe the construction, working principle and characteristics of thermocouple.	(7)	CO3	[K_1]
	(ii) Discuss in detail the working principle of Piezoelectric transducer.	(7)		
26.	(i) Explain the operation of a Harmonic distortion analyzer with necessary sketch.	(7)	CO4	[K_L]
	(ii) Explain the various key elements of a digital voltmeter.	(7)		
27.	Explain the generalized schematic of various Multi channel Data Acquisition System. List out its advantages over single channel data acquisition system.		CO5	[K_L]

****