Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title:	**ELECTRICAL MEASUREMENTS &MEASURING INSTRUMENTS**	Course Code	: 15EE42T
Semester	: **IV**	Course Group	: **Core**
Teaching Scheme (L:T:P)	: **4:0:0**(in Hours)	Credits	: **4 Credits**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **52**
CIE	: **25 Marks**	SEE	: **100 Marks**

Pre-requisites : Elements of electrical engg, electrical circuits, digital& analog electronics.
Course Objectives :To introduce and understand the of Electrical measurements, with the effects of electrical current, analog & digital electronics principles, calibration techniques, range extension, special type measuring instruments, transducers& applications.

Course Topics:

Unit No	Unit Name	Hours
1	Characteristics & Classification of instruments.	4
2	Construction & Operation of indicating instruments.	12
3	Construction & Operation of Watt meter & energy meter.	8
4	Measurement of R,L,C.	4
5	Digital meters.	12
6	Transducers & Sensors, Signal Conditioning circuits.	12
	Total	**52**

Course Outcomes

On successful completion of the course, the students will be able to,

1. Understand the Characteristics and Classification of measuring instruments.
2. Explain the construction and operation of indicating instruments.
3. Explain the construction and operation of Watt meters and Energy meters.
4. Interpret the methods of measurements of resistance, inductance and capacitance.
5. Explain digital meters, types, comparison, advantages and disadvantages.
6. Understand different transducers, sensors, and signal conditioning method.

Composition of Educational Components

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's Taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)	Total Marks (Out of 145)
1	Remembering	7	10
2	Understanding	70	105
3	Application/ Analysis	23	30
Total		**100**	**145**

Course Outcome linkage to Cognitive Level

Cognitive Level Legend: R- Remember, U- Understand, A- Application

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand the Characteristics and Classification of measuring instruments.	***R/U***	2, 10	4
CO2	Explain the construction and operation of indicating instruments.	***U***	2,10	12
CO3	Explain the construction and operation of Watt meters and Energy meters.	***U/A***	2,10	8
CO4	Interpret the methods of measurements of resistance, inductance and capacitance.	***U/A***	2,10	4
C05	.Explain digital meters, types, comparison, advantages and disadvantages.	***U***	2,10	12
C06	Understand different transducers, sensors, and signal conditioning method.	***R/U/A***	2,10	12
		Total sessions		**52**

Course Content and Blue Print of Marks for SEE:

Unit No	Unit Name	Hour	Max. Marks per Unit	Questions to be set for (5marks) PART - A			Questions to be set for (10marks) PART - B			Marks weightage (%)
				R	U	A	R	U	A	
1	Characteristics & Classification of instruments.	4	10	1				0.5		7
2	Construction & Operation of indicating instruments.	12	35		2			2.5		24
3	Construction & Operation of Watt meter & energy meter.	8	25			1		1	1	17
4	Measurement of R,L,C.	4	10		1				0.5	7
5	Digital meters.	12	35		2			2.5		24
6	Transducers & Sensors, Signal Conditioning circuits.	12	30	1	1			1	1	21
	Total	**52**	**145**	**9 (45 Marks)**			**10 (100 Marks)**			**100**

Course-PO Attainment Matrix

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Electrical Measurements and Measuring Instruments	-	**3**	-	-	-	-	-	-	-	**3**

LEVEL 3- HIGHLY ADDRESSED, LEVEL 2-MODERATELY ADDRESSED, LEVEL 1-LOW ADDRESSED.

METHOD IS TO RELATE THE LEVEL OF PO WITH THE NUMBER OF HOURS DEVOTED TO THE COS WHICH ADDRESS THE GIVEN PO.
IF ≥40% OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 3
IF 25 TO 40% OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 2
IF 5 TO 25% OF CLASSROOM SESSIONS ADDRESSING A PARTICULAR PO, IT IS CONSIDERED THAT PO IS ADDRESSED AT LEVEL 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Course Contents:

Unit I

Characteristics & Classification of instruments. 04hrs

Characteristics of instruments, precision, accuracy, sensitivity, resolution, tolerance, errors, types of errors, classification of instruments, necessity of torque instruments & types.

Unit II

Construction & Operation of indicating instruments. 12hrs

Construction and operation of moving coil, moving iron voltmeter and ammeter, calibration and range extension of voltmeter, ammeter, mention the types, applications, advantages and disadvantages.

Unit III

Construction & Operation of Watt meter & energy meter. 08hrs

Construction and operation of wattmeter, measurement of power by two wattmeter method. Energy meter, Calibration of energy meter, mention the types, applications, errors, advantages and disadvantages.

Unit IV

Measurement of Resistance, Inductance and Capacitance. 04hrs

Measurement of unknown resistance by using wheatstonebridge, Kelvinbridge. Measurement of inductance by using Maxwell's bridge. Measurement of capacitance by using Schering Bridge.

Unit V

Digital meters. 12hrs

Block diagram and explain operation of Digital frequency meter, digital synchronoscope, digital non contact type tachometer, digital p.f.meter, digital trivectormeter, digital tong tester, digital LCR meter, digital multimeter and voltmeter (only BLOCK DIAGRAMS) and their applications, advantages and disadvantages, comparison with analog meters.

Unit VI

Transducers, Sensors & Signal conditioning circuits. 12hrs

Meaning of transducers, selection of transducers, Need for signal conditioning, block diagram of a.c. and d.c. signal conditioning, applications explain with a circuit diagram, strain gauges LVDT, RVDT, Thermocouple, Pyrometer, Peizo-electric, Opto-sensor, Bolometer for measuring AF & RF power measurements, applications.

Reference Books:

1. Electrical Measurements & measuring instruments By G.K.Banerjee**PHI Publications**
2. Instrumentation & Control by **D.Patranabis** by **PHI Publications**
3. Electrical Measurements & measuring instruments by **A.K.SawhneyDhanpatRai publications**

E-Resources:

1. *www.academia.edu/.../A_K.Sawhney-A_course_in_Electrical_and_Elect...*

2.*https://en.wikipedia.org/.../List_of_electrical_and_electronic_measuring_*

3. *Nptel.iitg.ernet.in › ... › Electrical and Electronic Measurements (Video)*

4.*www.npl.co.uk/.../beginners-guide-to-measurement-in-electronic-and-ele..*

Course Delivery:

The Course will be delivered through Lectures, Classroom Interaction, Animations, Group Discussion, Exercises and Assignments.

Course Assessment and Evaluation Scheme:

<table>
<tr><th colspan="2"></th><th>What</th><th>To Whom</th><th>Frequency</th><th>Max Marks</th><th>Evidence Collected</th><th>Course Outcomes</th></tr>
<tr><td rowspan="4">Direct Assessment</td><td rowspan="3">CIE (Continuous Internal Evaluation)</td><td>I A Tests</td><td rowspan="3">Students</td><td>Three tests (average of three)</td><td>20</td><td>Blue Books</td><td>1 to 6</td></tr>
<tr><td></td><td>Student Activity</td><td>05</td><td>Hand written report</td><td>1 to 6</td></tr>
<tr><td></td><td>TOTAL</td><td>25</td><td></td><td></td></tr>
<tr><td>SEE (Semester End Examination)</td><td>End Exam</td><td>Students</td><td>End Of the Course</td><td>100</td><td>Answer Scripts at BTE</td><td>1 to 6</td></tr>
<tr><td rowspan="2">Indirect Assessment</td><td colspan="2">Student Feedback on course</td><td rowspan="2">Students</td><td>Middle Of The Course</td><td colspan="2" rowspan="2">Questionnaire</td><td rowspan="2">1 to 6</td></tr>
<tr><td colspan="2">End Of Course Survey</td><td>End Of The Course</td></tr>
</table>

***CIE** – Continuous Internal Evaluation ***SEE** – Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Suggested Student activity:

1.) Perform an activity using CRO and signal generator for measuring frequency, amplitude and time period of various electrical quantities in graph book with neat sketch.

2.) Prepare min 2 pages of self hand-written report on standard meters used in nearby industries or substations (Each group has to carry out the activity individually and report should be maintained).

MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY (Course Coordinator)

Dimension	Scale					Students score (Group of five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	3				
2	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	2				
3	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	5				
4	Descriptor	Descriptor	Descriptor	Descriptor	Descriptor	4				
Note: Concerned faculty (Course coordinator) must devise appropriate rubrics/criteria for assessing Student activity for 5 marks **One activity on any one CO (course outcome) may be given to a group of FIVE students** **Grand Average/Total**						14/4 =3.5 ≈4				

Example only: MODEL OF RUBRICS / CRITERIA FOR ASSESSING STUDENT ACTIVITY-
Task given- Industrial visit and report writing

Dimension	Scale					Students score (Five students)				
	1 Unsatisfactory	2 Developing	3 Satisfactory	4 Good	5 Exemplary	1	2	3	4	5
1.Organisation	Has not included relevant info	Has included few relevant info	Has included some relevant info	Has included many relevant info	Has included all relevant info needed	3				
2. Fulfill team's roles & duties	Does not perform any duties assigned	Performs very little duties	Performs partial duties	Performs nearly all duties	Performs all duties of assigned team roles	2				
3.Conclusion	Poor	Less Effective	Partially effective	Summarises but not exact.	Most Effective	5				
4.Conversions	Frequent Error	More Error	Some Error	Occasional Error	No Error	4				
					Total marks	14/4=3.5 ≈4				

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM		20
	Year:		

Name of Course coordinator : Units:__
CO's:____

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal Choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
1st Test/ 6 th week, 9 Feb 16, 10-11 AM	IV SEM, E & E Engg	**Electrical Measurements and Measuring Instruments**	20
	Year: 2015-16	Course code:	

Name of Course coordinator :
Units Covered :1 and 2
Course Outcomes : 1 and 2
Instruction :*(1). Answer all questions (2). Each question carries five marks*

Question No.	Question	CL	CO	PO
1	Define a).precision b).accuracy c).sensitivity d) resolution e) tolerance f) errors.	R	1	2, 10
2	Define error? Mention the types of errors. OR Explain the necessity of torque in instruments. List the types of torque.	R U	1	2, 10
3	Explain the construction and operation of moving coil ammeter with neat sketch.	U	2	2, 10
4	Design a single range d.c.milliammeter using basic movement with an internal resistance Rm =30ohm and an full deflection current Im=1mA.Range is 0-10mA OR Comapre Shunts with series multipliers.	U U	2	2, 10

CL: Cognitive Level, R-Remember, U-Understand, A-Application, PO: Program Outcomes

COURSE CONTENT OF ELECTRICAL MEASUREMENT & MEASURINGINSTRUMENTS

Lesson no/Topic no	Unit	Session/Duration
I	**Characteristics & Classification of instruments.**	04hrs
1	Characteristics of instruments, precision, accuracy, sensitivity, resolution, tolerance,	01
2	Errors, types of errors in instruments.	01
3	Necessity of torque instruments & types.	01
4	Classification of instruments.	01
II	**Construction & Operation of indicating instruments.**	**12hrs**
5	Construction and operation of moving coil voltmeter.	01
6	Construction and operation of moving coilammeter.	01
7	Construction and operation of moving iron voltmeter.	01
8	Construction and operation of moving iron ammeter	01
9	Calibration moving coil voltmeter.	01
10	Calibration moving iron ammeter.	01
11	Range extension of moving coil and moving iron ammeter. Simple problems.	01
12	Range extension of moving coil and moving iron voltmeter. solve simple problems	01
13	Mention the types range extension used for D.C meters.	01
14	Advantages and disadvantages of moving coil & moving iron instruments.	01

15	Applications moving coil & moving iron instruments.	01
16	Mention the types range extension used for A.C meters	01
III	**Construction & Operation of Watt meter & energy meter.**	**08hrs**
17	Types of wattmeter, construction and operation of wattmeter.	01
18	Measurement of power by two wattmeter method, solve simple problems	01
19	Types of energy meter, construction and operation of energy meter.	01
20	Measurement of energy by energy meter.	01
21	Measurement of energy by energy meter.	01
22	Calibration of single phase energy meter.	01
23	Errors in watt meter, errors in energy meter, solve simple problems	01
24	Applications, advantages and disadvantages.	01
IV	**Measurement of Resistance Inductance and Capacitance.**	**04hrs**
25	Measurement of unknown resistance by using Wheatstone bridge. Solve simple problems.	01
26	Measurement of unknown resistance by using Kelvin's bridge, solve simple problems.	01
27	Measurement of inductance by using Maxwell's bridge, simple problems.	01
28	Measurement of capacitance by using Schering Bridge, simple problems.	01

V	**Digital meters**	**12hrs**
29	With neat Block diagram and explain operation of Digital frequency meter.	01
30	applications, advantages and disadvantages, comparison with analog meters	01
31	With neat Block diagram and explain operation of digital synchronoscope.	01
32	Digital synchronoscope. applications, advantages and disadvantages, comparison with analog meters	01
33	With neat Block diagram and explain operation of digital non contact type tachometer	01
34	Digital non contact type tachometer, applications, advantages and disadvantages, comparison with analog meters.	01
35	With neat Block diagram and explain operation of digital p.f meter,	01
36	Digital p.f.meter, applications, advantages and disadvantages, comparison with analog meters.	01
37	With neat Block diagram and explain operation of digital trivector meter& Their applications, advantages and disadvantages, comparison with analog meters.	01
38	With neat Block diagram and explain operation of digital tong tester, their applications.	01
39	With neat Block diagram and explain operation of digital LCR meter,	01
40	Digital multimeter and voltmeter, their applications, advantages and disadvantages, comparison with analog meters.	01
VI	**Transducers, Sensors& Signal conditioning circuits.**	**12hrs**
41	Meaning of transducers, selection of transducers,	01
42	Need for signal conditioning Operation of a.c. signal conditioning system with Block diagram.	01

43	D.C. signal conditioning system with Block diagram.	01
44	Explain operation strain gauges with a circuit diagram.	01
45	Explain operation of LVDT with neat sketch, applications.	01
46	Explain operation of RVDT with neat sketch, applications.	01
47	Explain operation of Pyrometer with neat sketch, applications.	01
48	Explain operation of Opto-sensor with neat sketch, applications.	01
49	Explain operation of Peizo-electric transducer with neat sketch, applications.	01
50	Explain operation of Bolometer for AF power measurement with neat sketch.	01
51	Explain operation of Bolometer for RF power measurement with neat sketch.	01
52	Applications of Bolometer in RF & AF power measurement.	01

Model Question Paper:

Code: 15EE42T

IV Semester Diploma Examination.

ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

[Time: 3 Hours] **[Max. Marks: 100]**

Note: (i)Answer any **SIX** questions from Part – A.*(Each question carries 5 marks)*
(ii)Answer any **SEVEN** questions from Part – B. *(Each question carries 10 marks)*

PART - A

1. Define a).precision b).accuracy c).sensitivity d) resolution e) tolerance f) errors. 5

2.Define calibration? Mention the merits. 5

3.Illustrate the methods employed for range extension in D.C ammeter& voltmeter. 5

4.A wattmeter is having a voltage range of 150/300v and current range of 2.5/5A, with P=625W ,determine wattmeter constant 5

5.Classify the types of bridges used for measuring unknown R,L,C5

6. Write a neat block diagram of digital p.f.meter. 5

7. Define transducer? List any three types of transducers. 5

8. List any three merits &any two de-merits of Digital voltmeter. 5

9. Explain with neat block diagram explain operation of digital tong tester. 5

PART - B

1.a)Define error? Mention the types of errors. 5

b) If the reading s of the two wattmeters connected across the load share 250W and 1.5KW, determine p.f. of the load. 5

2.a)Explain the construction and operation of moving coil voltmeter with neat sketch. 7

b).List any three merits of MC voltmeter. 3

3. a) Describe the calibration moving coil voltmeter with neat sketch. 6

b) Design a single range d.c milliammeter using basic movement with an internal resistance R_m=30ohm and a full scale deflection current I_m=1mA.Range is 0-10mA. 4

4. a) Describe the calibration wattmeter with neat sketch. 7

b) List the any 3 errors. 3

5.a)Describe the measurement of unknown resistance using Wheat stone's bridge with neat sketch. 5

b)Determine the value resistance required to balance the bridge. If the three arms of the wheat stone's bridge are having resistances of 50Ω,100Ω,150Ω respectively, find the value resistance required to balance the bridge. 5

6.a) Sketch and explain block diagram of digital trivector meter. 6

b) List any two advantages and disadvantages of digital tong tester. 4

7.a)Sketch and explain block diagram of digital LCR meter. 6

b)Compare analog frequency meter with digital frequency meter. 4

8.a) Sketch and explain circuit diagram of LVDT. 7

b)List any three applications of RVDT. 3

9.a)Sketch and explain circuit diagram of Bolometer for AF power measurement. 7

b)List any three applications of opto-sensor. 3

10.a) Sketch block diagram of digital non contact type digital tachometer. 6

b) Summarize the necessity of signal conditioning? 4

MODEL QUESTION BANK

Code: 15EE42T

III Semester Diploma Examination.
ELECTRICAL MEASUREMENTS & MEASURING INSTRUMENTS

Cognitive Level: REMEMBER

1. Define a).precision b).accuracy c).sensitivity d).resolution e).tolerance f).errors.
2. Define error? Mention the types of errors.
3. Define calibration? Mention the merits.
4. List the application MI instruments.
5. List the merits of MI instruments.
6. List the de-merits of MI instruments.
7. List the methods for range extension in D.C ammeter & voltmeter.
8. List the methods for range extension in A.C ammeter & voltmeter.
9. Mention the merits and de-merits of disc type energy meter .
10. List the types of bridges used for measuring unknown R,L,C.
11. List the application of MC instruments.

Cognitive Level: UNDERSTAND

12. Classify the measuring instruments.
13. Explain the necessity of torque in instruments. List the types of torque.
14. Sketch a neat block diagram of digital p.f.meter.
15. Sketch a neat block diagram of digital non contact type tachometer.
16. Sketch a neat block diagram of digital LCR meter.
17. List any 3 applications of Digital frequency meter and Digital synchronoscope.
18. List any 3 applications of a)Digital p.f. meter. b)Digital voltmeter.
19. List any 3 applications of a)Digital non contact type tachometer. b)Digital LCR meter.
20. List any 3 applications of a)Digital Multimeter. b)Digital tongtester.
21. List any five applications of trivector meter.
22. List the merits & de-merits of a)Digital frequency meter b)Digital synchronoscope.
23. List the de-merits of a)Digital frequency meter. b)Digital synchronoscope.
24. List the advantages of a)Digital p.f. meter. b)Digital voltmeter.
25. List the dis-advantages ofa)Digital non contact type tachometer. b)Digital LCR meter.
26. List the advantages of
27. Sketch a neat block diagram of A.C signal conditioning.
28. Sketch a neat block diagram of D.C signal conditioning.
29. List the applications of wattmeter and energy meter.
30. Explain calibration of 1Phase wattmeter.
31. Explain calibration of 1Phase energy meter.
32. What is transducer? List any three types.
33. Explain the operation of Thermocouple with neat sketch.

Cognitive Level: APPLICATION

34. Determine wattmeter constant with wattmeter is having a voltage range of 150/300v and current range of 2.5/5A,with P=625W.
35. Sketch a neat block diagram of digital frequency meter.
36. Sketch a neat block diagram of digital multimeter meter.
37. Sketch a neat block diagram of digital voltmeter.
38. Sketch a neat block diagram of digital synchronoscope.
39. Sketch a neat block diagram of digital tong tester, Digital Multimeter, Digital tong tester
40. Explain the operation of strain gauge with neat sketch.
41. Explain the operation of LVDT with neat sketch.
42. Explain the operation of RVDT with neat sketch.
43. Explain the operation Pyrometer with neat sketch.
44. Explain the operation of Peizo-electric transducer with neat sketch.
45. Explain the operation of Bolometer for AF power measurement with neat sketch.
46. Explain the operation of Bolometer for RF power measurement with neat sketch.
47. Illustrate need for signal conditioning. List the applications with neat sketch.
48. Compare LVDT with RVDT.

UNIT-II

Cognitive Level: UNDERSTAND

49. List any three merits of MC voltmeter.
50. List any 3 merits of MC ammeter.
51. List any 3 demerits of MI voltmeter.
52. List any three demerits of MI ammeter.
53. Explain the construction and operation of moving coil voltmeter with neat sketch.
54. Explain the construction and operation of moving coil ammeter with neat sketch.
55. Explain the construction and operation of moving iron voltmeter with neat sketch.
56. Explain the construction and operation of moving iron ammeter with neat sketch.
57. Describe the calibration moving coil voltmeter with neat sketch.
58. Design a single range d.c.milliammeter using basic movement with an internal resistance Rm=30ohm and an full deflection current Im=1mA.Range is 0-10mA
59. Describe the calibration moving coil ammeter with neat sketch.
60. A moving coil voltmeter type having a internal resistance of 20Ω gives a full scale deflection with a voltage of 20mV.Calculate the value of multiplier required.
61. Describe the calibration moving iron ammeter with neat sketch.
62. Comapre Shunts with series multipliers.

UNIT-III

Cognitive Level: UNDERSTAND

63. Explain the construction and operation of wattmeter with neat sketch.
64. Explain the construction and operation of energy meter with neat sketch.
65. Describe the calibration of wattmeter with neat sketch.
66. List the any 3 errors.

Cognitive Level: APPLICATION

67. If the reading s of the two wattmeters connected across the load are 250W and 1.5KW,determinep.f. of the load.
68. The meter constant of 230V,10A energy meter is 1000rev/Kwh. The meter is tested at half load and rated voltage at unity p.f. and found to make 40rev in 65sec.Determine meter error at half load.
69. Describe the calibration of energy meter with neat sketch.

UNIT-IV

Cognitive Level: UNDERSTAND

70. Illustrate the measurement of unknown resistance using Wheat stone's bridge .
71. Explain the measurement of unknown resistance using Kelvin's bridge .
72. Illustrate the measurement of unknown capacitance using Schering bridge .

Cognitive Level: APPLICATION

73. Determine the value resistance required to balance the bridge. If the three arms of the wheat stone's bridge are having resistances of 50ohm,100ohm,150ohm respectively.
74. If the three arms of the wheat stone's bridge are having resistances of 5KΩ,10 KΩ,15 KΩ respectively, find the value of resistance required to balance the bridge.
75. Illustrate the measurement of unknown inductance using Maxwell's bridge.
76. Determine the value unknown inductance required to balance the bridge. If the four arms of the Maxwell's bridge are arranged as follows; Arm AB is non reactive resistance of 1KΩ in parallel with capacitance of 0.5μF,arm BC is non reactive resistance of 700Ω;arm CD is unknown inductance and arm DA is non-reactive resistance of 600Ω.
77. The Schering bridge employs a standard air capacitor C2 of 100pF a non reactive resistance R1 of 300Ω in parallel with variable capacitor C1 and variable resistance R2.Balance is obtained with C1=0.4μF and R2=250Ω calculate the capacitance Cx and resistance Rx.

UNIT-V

Cognitive Level: UNDERSTAND

78. Explain operation of digital frequency meter with neat block diagram.
79. List any two merits and de-merits of digital frequency meter.
80. Explain operation of digital synchronoscope with neat block diagram..
81. List any two merits and de-merits of digital synchronoscope.
82. Explain operation of digital P.f. meter with neat block diagram.
83. List any two merits and de-merits of digital p.f. meter.
84. Explain operation of digital LCR meter with neat block diagram.
85. List any two merits and de-merits of digital LCR meter.
86. Explain operation of digital trivector meter with neat block diagram.
87. List any two merits and de-merits of digital trivector meter.
88. Explain operation of digital non contact type tachometer with neat block diagram.
89. List any two merits and de-merits of digital non contact type tachometer.
90. Explain operation of digital tong tester with neat block diagram.
91. List any two merits and de-merits of digital tong tester.
92. Explain operation of digital multimeter with neat block diagram.
93. List any two merits and de-merits of digital multimeter.
94. Explain operation of digital voltmeter with neat block diagram.
95. List any two merits and de-merits of digital voltmeter.
96. Compare analog multimeter with digital multimeter.
97. List any four applications of digital multimeter.
98. Differentiate analog p.f meter with digital p.f.meter.
99. List any four applications of digital p.f.meter.
100. Compare analog frequency meter with digital frequency meter.
101. List any four applications of digital frequency meter.
102. Differentiate analog voltmeter with digital voltmeter.
103. List any four applications of digital voltmeter.
104. Differentiate analog LCR with digital LCR meter.
105. List any four applications of digital LCR meter.

UNIT-VI

Cognitive Level: REMEMBER

106. List any three applications of LVDT.
107. List any three applications of RVDT.
108. List any three applications of thermocouple.
109. List any three applications of Bolometer for AF power measurement.
110. List any three applications of Bolometer for RF power measurement.
111. List any three applications of Peizo-electric transducer.
112. List any three applications of opto-sensor.

113. List any three applications of Pyrometer.

Cognitive Level: UNDERSTAND

114. Explain A.C.signal conditioning system with neat sketch.
115. List the four parameters on which transducers can be selected.
116. Explain D.C.signal conditioning system with neat sketch..
117. Necessity of signal conditioning.

Cognitive Level: APPLICATION

118. Explain operation of LVDT with neat sketch.
119. Explain operation of RVDT with neat sketch..
120. Explain operation of thermocouple with neat sketch..
121. Explain operation of Bolometer used for AF power measurement with neat sketch.
122. Explain operation of Bolometer used for RF power measurement with neat sketch.
123. Explain operation of Peizo-electric transducer with neat sketch.
124. Explain operation of opto-sensor with neat sketch.
125. Explain operation of Pyrometer with neat sketch.
