B.TECH/EE/4TH SEM/ELEC 2202/2017

problem may arise?

- 7. (a) Write short note on any one of the following:(i) Drysdale Polar Potentiometer(ii) Megger.
 - (b) In a test by Murray loop method for an earth fault on a 520 m length of cable having a resistance of 1.1 Ω per 1000 m, the faulty cable is looped with a sound cable of the same length but having a resistance 2.29 Ω per 1000 m. The resistances of the other two arms of the testing network at balance are in the ratio of 2.7:1. Calculate the distance of the fault from the testing end of the cable.

6 + 6 = 12

Group – E

- 8. (a) Explain the circuit diagram and principle of operation of a Chopper Amplifier type voltmeter using photo diodes.
 - (b) Explain with the help of a block diagram, the various parts of an electronic multimeter. 7 + 5 = 12
 - Draw and describe the block diagram of integrating type digital
 - voltmeter.(b) What are the functions of delay line and time base generator in a cathode ray oscilloscope (CRO)? If no delay line is provided, what

6 + (2 + 2 + 2) = 12

B.TECH/EE/4TH SEM/ELEC 2202/2017

ELECTRICAL & ELECTRONIC MEASUREMENT (ELEC 2202)

Time Allotted : 3 hrs

Full Marks: 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A (Multiple Choice Type Questions)

1. Choose the correct alternative for the following:

 $10 \times 1 = 10$

- (i) Fluid friction damping can be used in
 (a) horizontally mounted instrument
 (b) vertically mounted instrument
 (c) portable instruments
 (d) all of the above.
- (ii) A wattmeter has a full scale range of 2500 watt. It has an error of ±1% of true value. What would be the range of reading if true power is 1250 watt?
 (a) 1225W 1275W
 (b) 1245W 1255W
 (c) 1200W 1300W
 (d) 1237.5W 1262.5W.
- (iii) A 1 mA ammeter has a resistance of 100 Ω . It is to be converted to a 1 A ammeter. The value of shunt resistance is (a) 0.001 Ω (b) 0.0999 Ω (c) 100000 Ω (d) 100 Ω .
- (iv) The nominal ratio of a current transformer is:
 (a) primary winding current/secondary winding current
 (b) rated primary winding current/ rated secondary winding current
 (c) number of secondary winding turns/number of primary winding turns
 (d) all of the above.
 (v) Electronic voltmeters which use rectifiers employ negative feedback.
- This is done (a) to increase overall gain (b) to improve stability
 - (c) to decrease overall gain (d
 - (d) to overcome non linearity of diode.

9. (a)

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- (vi) Creeping in a single phase induction type energy meter may be due to
 (a) over compensation for friction
 (b) over voltage
 (c) vibration
 (d) all of the above.
- (vii) In an electrodynamometer type of wattmeter
 - (a) the current coil is made fixed
 - (b) the potential coil is made fixed
 - (c) any of the two coils CC or PC is made fixed
 - (d) both coils should be movable.
- (viii) Capacitance can be measured by using (a) Maxwell's bridge

(b) Schering bridge (d) Wien bridge.

- (ix) Kelvin double bridge is used to measure
 (a) low resistance
 (b) medium resistance
 (c) high resistance
 (d) very high resistance.
- (x) In a CRT the focusing anode is located
 - (a) between pre-accelerating and accelerating anode
 - (b) after accelerating anode
 - (c) before pre-accelerating anode
 - (d) none of the above.

(c) Hay's bridge

Group – B

2. Explain the working principle of a moving iron (MI) type indicating instrument. What are the advantages and disadvantages of MI instruments? Mention the errors involved in measuring ac and dc quantities by such instruments.

(5+4+3) = 12

- 3. (a) An electrostatic voltmeter reads up to 1 KV is controlled by a spring with spring constant of 1×10^{-7} N-m/degree and has a full scale deflection of 80°. The capacitance at zero voltage is 1×10^{-11} Farad. What is the capacitance when the pointer indicates 1 KV?
 - (b) How the extension of range of rectifier type instruments is carried out for ac measurement? What is the most suitable material used to design the rectifier type instruments? Discuss the properties of the material.
 6 + (3 + 1 + 2) = 12

Group – C

- 4. (a) Draw the equivalent circuit and phasor diagram of a potential transformer and explain its principle of operation.
 - (b) A current transformer with a bar primary has 300 turns in its secondary winding. The resistance and reactance of the secondary circuit are 1.5 Ω and 1 Ω respectively including the transformer winding, with 5 A flowing in the secondary winding. The magnetizing mmf is 100 A and the iron loss is 1.2 W. Determine the ratio and phase angle error.

(3+4) + (3+2) = 12

5. (a) Describe the functions of the following in a single phase induction type energy meter:
(i) shunt and series magnets (ii) moving disc (iii) permanent magnet

(i) shunt and series magnets (ii) moving disc (iii) permanent magnet (iv) shading bands.

(b) A dynamometer type of wattmeter is rated at 10 A and 100 V with a full scale reading of 1000 W. The inductance of the voltage circuit is 5 mH and the resistance is 3000Ω . If the voltage drop across the current coil of the wattmeter is negligible, what is the error in the wattmeter at the rated VA rating with zero power factor? Frequency of operation is 50 Hz.

 $(4 \times 1.5) + 6 = 12$

Group – D

- 6. (a) How is Wien Bridge used to measure unknown frequency? Derive the condition for balance of the bridge and find frequency in terms of bridge parameters. Also draw the phasor diagram.
 - (b) The four arms of a bridge are:

arm ab : an imperfect capacitor C_1 with an equivalent series resistance r_1 , arm bc : a non-inductive resistance R_3 , arm cd : a non inductive resistance R_4 ,

arm da : an imperfect capacitor C_2 with it's internal $\mbox{ resistance of } r_2$ is in series with a resistance R_2

A supply of 450 Hz is given between terminals a and c and the detector is connected between b and d. At balance R_2 = 4.8 Ω , R_3 = 2000 Ω , R_4 = 2850 Ω and C_2 = 0.5 uF.

$$r_2 = 0.4 \Omega$$
.

Calculate the values of C_1 and r_1 and the dissipating factor of C_1 .

(1+4+2)+5=12