Instructions —

1. All Questions are Compulsory.
2. Answer each next main Question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of Non-programmable Electronic Pocket Calculator is permissible.
7. Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

1. Attempt any TEN of the following: 20
   
a) Define resolution and accuracy.
b) List the effects of electric current used in indicating instruments.
c) State one example of each of indicating and integrating instruments.
d) Give classification of measuring instruments.
e) State the principle of operation of PMMC instrument.
f) List one method of range extension of d.c. ammeter and a.c. ammeter.
g) A single phase wattmeter rated for 500V, 10A has full scale deflection of 1250 Watt. What is the multiplying factor of wattmeter.

h) Give the methods of measurement of active power in 3-phase circuit.

i) State the meaning of creeping error in energy meter and how it is prevented?

j) State the classification of resistance as per their values.

k) State use of megger and LCR meter.

l) State the use of storage type digital oscilloscope.

2. Attempt any FOUR of the following: 16

a) List the types of systematic errors and state the reasons due to which these errors occurs.

b) Compare PMMC and MI instrument on basis of :-
   i) Principle of working
   ii) Torque to weight ratio
   iii) Nature of scale
   iv) Use

c) Describe how C.T. is used to extend range of ammeter with a neat circuit diagram.

d) Draw a circuit diagram to measure power in 1-phase 230V, 50Hz a.c. circuit connected with a load of 1kW using dynamometer type wattmeter. State the wattmeter specification.

e) What is connection error in wattmeter? Describe with neat connection diagram. State the method of compensate it.

f) A wattmeter is rated for 600V, 5/10A with FSD of 1500W. The reading obtained when used on 10A range is 1000W. Find out the actual power consumed in load.
3. **Attempt any FOUR of the following:**

a) Describe the production of damping torque using air friction damping method.

b) With neat diagram describe construction and operation of potential transformer.

c) A moving coil instrument gives a full scale deflection with 10mA and has a resistance of 50 ohm. Calculate the resistance necessary to be put in series/parallel with the instrument so that it may be used as -

i) 0-5A ammeter

ii) 0-250V voltmeter

d) Draw a neat labelled circuit diagram and phasor diagram of one wattmeter method of reactive power measurement in 3-phase balanced load.

e) Draw a block diagram of electronic energy meter and state function of each block.

f) Explain working of clip-on-ammeter with neat diagram.

4. **Attempt any FOUR of the following:**

a) State any two advantages and disadvantages each of moving iron instruments.

b) A 3-phase 500V motor load has a power factor of 0.4. Two wattmeters are connected to measure input. They show the input to be 30kW. Find out reading of each wattmeter.

c) Draw a neat labelled diagram of 3-phase, 4 wire induction type energy meter.

f) With a neat circuit diagram, describe the working of dynamometer type 1-phase power factor meter.
5. **Attempt any **FOUR** of the following:**

a) Draw a neat labelled diagram of megger showing constructional details.

b) A single phase energy meter has a constant of 6000 rev./kwh. A test was carried out with resistive load for one minute during which meter disc makes 21 revolutions. The voltage was 110V and current 2A. Calculate the percentage meter error.

c) Observe the following diagram Figure No. 1 and state the direction of rotation when phase sequence is

i) RYB

ii) BRY

![Phase Sequence Indicator](attachment:image.png)

Phase Sequence Indicator

**Fig. No. 1**

d) Describe how LCR meter is used to measure capacitance.

e) State the function and material used for following parts of Repulsion type Moving Iron instrument :-

i) Fixed coil

ii) Moving iron

iii) Iron ring

iv) Control spring
f) State the effect of power factor on readings of two wattmeter in two wattmeter method for active power measurement in 3-phase balanced load for -

i) p.f. = 0.5
ii) p.f. = 0 lag
iii) p.f. = 1.0
iv) p.f. = 0.4 lag.

6. Attempt any FOUR of the following: 16

a) Describe the gravity control method to produce controlling torque in indicating instrument with neat diagram.

b) ‘PMMC instrument can only measure D.C. quantities’ Justify.

c) State the meaning of calibration of meters and explain concept of standard meters.

d) Draw a neat block diagram of CRO and state function of each block.

e) Describe working of ferrodynamic type frequency meter.

f) Draw a block diagram of function generator and give function of each block.