



ENGINEERING & MANAGEMENT EXAMINATIONS, DECEMBER – 2008
ELECTRICAL & ELECTRONICS MEASUREMENT
SEMESTER – 3

Time : 3 Hours]

[Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) Swamping resistance is a resistance which added to the moving coil of a meter to

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|----------------------------------|-----------------------------|
| a) reduce the full scale current | b) reduce temperature error |
| c) increase the sensitivity | d) none of these. |
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ii) A d.c. voltmeter has a sensitivity of 1000 ohm/volt. When it measures half full scale in 100 V range, the current through the voltmeter is

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|-----------|-----------|
| a) 100 mA | b) 1 mA |
| c) 0.5 mA | d) 50 mA. |
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iii) LVDT is used to measure

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|-----------------|------------------------|
| a) displacement | b) temperature |
| c) pH value | d) intensity of light. |
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iv) Creeping is observed in

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|--------------------|------------------------|
| a) Watt-hour meter | b) Watt meter |
| c) Ammeter | d) Power factor meter. |
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v) A megger is used to measure

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|--------------------------|-------------------|
| a) voltage | b) current |
| c) insulation resistance | d) none of these. |
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vi) Frequency can be measured by

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|---------------------|---------------------|
| a) Maxwell's bridge | b) Scharing bridge |
| c) Wien's bridge | d) Campbell bridge. |
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vii) In an electrodynamicometer type wattmeter

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|----------------------------|-------------------------------|
| a) current coil is fixed | b) pressure coil is fixed |
| c) both of these are fixed | d) both of these are movable. |
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viii) The scale of a PMMC instrument is

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|------------------------|-------------------|
| a) uniform | b) cramped |
| c) cramped at the ends | d) none of these. |
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ix) The heater wire of a thermocouple instrument is made of very thin wire in order to

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|--|
| a) have high value of resistance |
| b) reduce skin effect |
| c) reduce the weight of the instrument |
| d) none of these. |
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x) The secondary winding of a CT is always kept

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|----------------------------|------------------------------|
| a) open circuited | b) short circuited |
| c) shorted with an ammeter | d) shorted with a voltmeter. |
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xi) Which of the following bridges is preferred for the measurement of inductance having high Q -factor ?

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|-------------------|----------------------|
| a) Maxwell bridge | b) Hay bridge |
| c) Owen bridge | d) DeSauty's bridge. |
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**GROUP – B****(Short Answer Type Questions)**Answer any *three* of the following. $3 \times 5 = 15$

2. What is phantom loading ? Explain with an example how it is more advantageous than testing with direct loading ?
3. Derive an expression for the torque in a moving iron instrument.
4. Explain the principle of operation of thermo-electric instruments.
5. Describe the construction and working principle of a storage oscilloscope.
6. What are the difficulties encountered in measuring high resistance ? What is guard circuit ?

GROUP – C**(Long Answer Type Questions)**Answer any *three* of the following questions. $3 \times 15 = 45$

7.
 - a) Write briefly about the construction of an electro-dynamometer type instrument.
 - b) Derive the torque equation of the instrument when an alternating current is passed through the coil.
 - c) List the principal errors of this type of instrument.
8.
 - a) Describe in brief the construction and working principle of a single phase induction type energy meter.
 - b) What is Blondel's theorem ?
 - c) A single phase kWhr. meter makes 500 revolutions per kWhr. It is found on testing that it is making 40 revolutions in 58.1 seconds at 5 kW load. Find out the percentage of error.
9.
 - a) Derive the equations of balance for an Anderson's bridge. Draw the phasor diagram for condition under balance.



b) The four arms of a bridge are :

- arm ab : an imperfect capacitor C_1 with an equivalent series resistance of 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 an equivalent series resistance of r_2 , series with a resistance R_2 .

A supply of 450 Hz is given between the terminals a and c and the detector is connected between b and d .

At balance : $R_2 = 4.8\Omega$, $R_3 = 2k\Omega$, $R_4 = 2.85k\Omega$, $C_2 = 0.5\mu F$ & $r_2 = 0.4\Omega$.

Calculate the value of C_1 , r_1 & also calculate dissipation factor of this capacitor.

Deduce the expression used. 5 + 2 + 8

10. a) Explain the principle of working of any digital voltmeter.
- b) Why are FETs used in differential amplifier type of electronic voltmeter ? Draw and explain the equivalent circuit of such a voltmeter.
- c) An electronic voltmeter has the following parameters :
- $R_d = 50 k\Omega$, a.c. drain resistance = $100 k\Omega$, transconductance = $0.005 mho$. If the meter has a resistance of $50 ohm$ and a full deflection current of $5 mA$, What voltage must be applied to the gate of one FET to produce full scale deflection current if the gate of the other FET is grounded ?

11. Write short notes on any three of the following : 3 x 5

- a) Frequency counter
- b) Megger
- c) Digital multimeter
- d) Frequency and phase measurement by oscilloscope.
- e) Ratio and phase angle error of potential transformer.

END