

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
End Semester Examination Dec 2019/Jan 2020
B.Sc. (Nautical Science)
Semester -II
UG21T4202 - Applied Physics & Electricity

Date: 03.01.2020
Time: 3 Hours

Max Marks: 70
Pass Marks: 35

Note:

Question No. 1 is compulsory
Answer any 6 Questions from remaining 8 questions (each of 10 marks)
Scientific calculator is permitted if required.

PART – A (5 × 2 = 10 Marks)

1. a) Define R.M.S. value of an AC.
- b) Define coefficient of coupling.
- c) State Thevenin's theorem.
- d) Define the term reactive power.
- e) Define self-inductance.

PART-B (6 × 10 = 60 Marks)

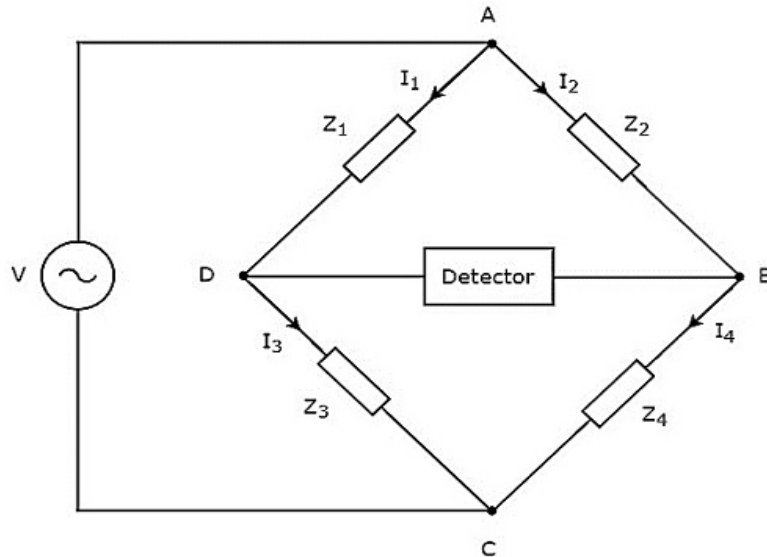
2. a) Explain mutually-induced e.m.f. and define its coefficient. (5 Marks)
- b) A coil of resistance 100Ω is placed in a magnetic field of 1 mWb. The coil has 100 turns and a galvanometer of 400Ω resistance is connected in series with it. Find the average e.m.f. and the current if the coil is moved in $1/10$ th second from the given field to a field of 0.2 mWb.
(5 Marks)
3. a) Define form factor and peak factor of AC. (5 Marks)
- b) A coil takes a current of 6 A when connected to a 24-V d.c. supply. To obtain the same current with a 50-Hz a.c. supply, the voltage required was 30 V. Calculate (i) the inductance of the coil (ii) the power factor of the coil.

(5 Marks)

4. a) With a neat diagram, explain the working of a Hay's bridge and derive the equation for balance. (5 Marks)

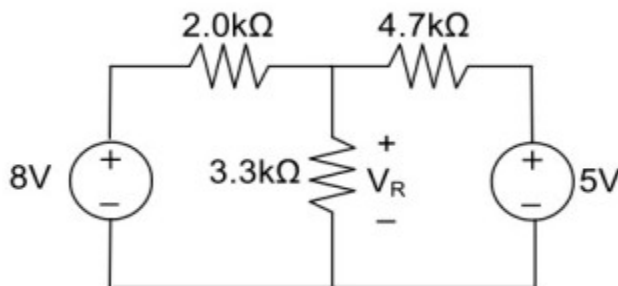
b) The four impedances of an ac bridge as shown in Fig. below are:

$Z_1 = 500 \angle 40^\circ \Omega$, $Z_2 = 100 \angle -90^\circ \Omega$, $Z_3 = 45 \angle 20^\circ \Omega$ and $Z_4 = 30 \angle 30^\circ \Omega$. Find out whether the bridge is balanced or not. (5 Marks)



5 a) State and explain Maximum power transfer theorem. (5 Marks)

b) Using the superposition theorem, determine the voltage drop across the resistor 3.3K as shown in the figure below. (5 Marks)



6 a) With a neat sketch explain the principle and working of AC generator. (5 Marks)

b) The field coils of a 6-pole d.c. generator each having 500 turns, are connected in series. When the field is excited, there is a magnetic flux of 0.02 Wb/pole. If the field circuit is opened in 0.02 second and residual magnetism is 0.002 Wb/pole, calculate the average voltage which is induced across the field terminals. (5 Marks)

7. a) Define Accuracy and Precision. (5 Marks)
- b) Explain construction and working of the thermistor for measurement of temperature. (5 Marks)
8. a) Explain the working of Series and Shunt type DC motor. (5 Marks)
- b) The four arms of Maxwell's inductance bridge are arranged as follows:
Arm ab consists of a coil with inductance L_1 and resistance r_1 in series with a non-inductive resistance R . Arm bc and cd are each a non-inductive resistance of $100 \text{ } \Omega$. Arm ad consists of standard variable inductor L_2 of resistance $32.7 \text{ } \Omega$. Balance is obtained when $L_2 = 47.8\text{mH}$ and $R = 1.36 \text{ } \Omega$. Find the resistance and inductance of the coil in arm ab. (5 Marks)
9. Write Short notes on any TWO. (2x5 = 10)
- a) Capacitors in Series and Parallel.
- b) Transducers.
- c) Millman theorem.
- d) Power factor and quality factor.
