

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

END SEMESTER EXAMINATION December/ January 2017/2018

Programme: B.Tech (Marine Engineering)

Semester: 1st Semester

Subject Name: Basic Electrical And Electronics Engineering

Subject Code: UG11T3104/

UG11T2104/ UG11T1104

Date: 12.12.2017

Maximum Marks: 100

Time: 03 Hrs

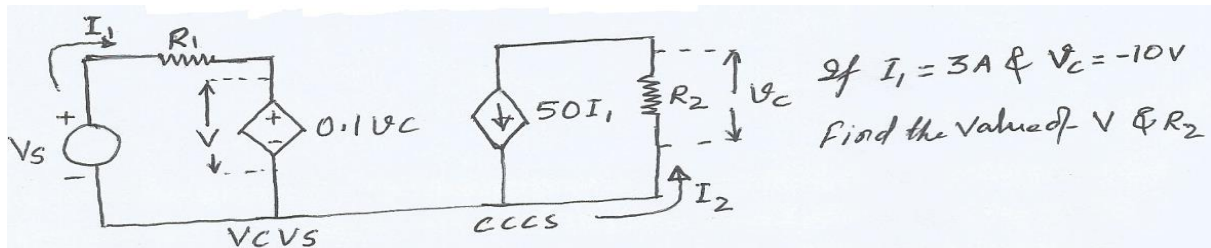
Pass Marks : 50

PART – A

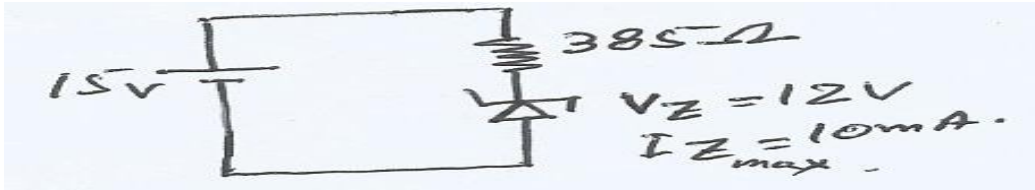
10x 3 Marks= 30 Marks

(All questions are compulsory)

Q 1)



- b) State Maximum power transfer theorem. For what type of circuit analysis this Theorem is used?
- c) What is power factor? Why we need to maintain the power factor high in electrical installation?
- d) In a balanced 3phase star configuration, establish the relationship between Line Voltage and phase voltage
- e) A Solenoid is wound with a coil of 100 turns. The coil is of length 50 cms. And is Carrying a current of 2 Amps. Determine the magnetic field strength at the line of the solenoid.
- f) A 230 V single phase energy meter has a constant load current of 20 A at unity power factor. If the meter disc makes 2300 revolutions during 2hrs, calculate the meter constant.
- g) In an electrical installation what is the significance of Earthing?
- h) The Zener diode shown is an ideal one. Find weather it is correctly biased or not



i) What is Extrinsic semiconductor?

J) Draw a basic diagram of a common emitter configuration transistor showing biasing and the current direction. Establish the relation $\beta = \alpha / 1 - \alpha$

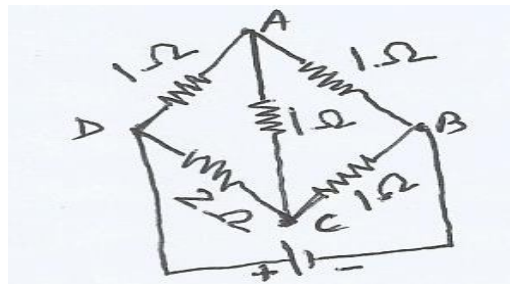
PART - B

(Answer any 5 of the following)

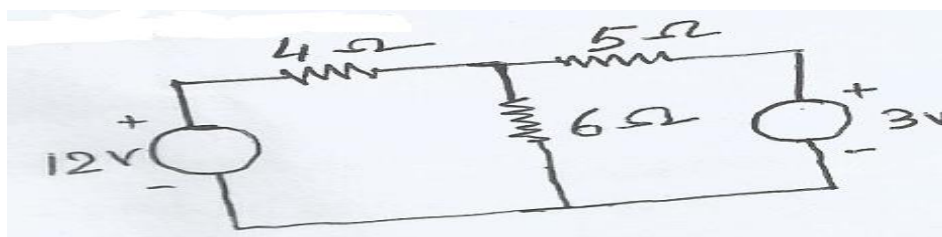
5 x 14 Marks = 70 Marks

Q/2 a) State Kirchhoff's laws.

b) A bridge network ABCD has arms AB, BC, CD and DA of resistances 1Ω , 1Ω , 2Ω and 1Ω respectively. If the detector between AC has a resistance of 1Ω , determine by Star / Delta transformation, the network resistance as viewed from the Battery terminals



c) Find the current in 6Ω resistance using Thevenin's theorem



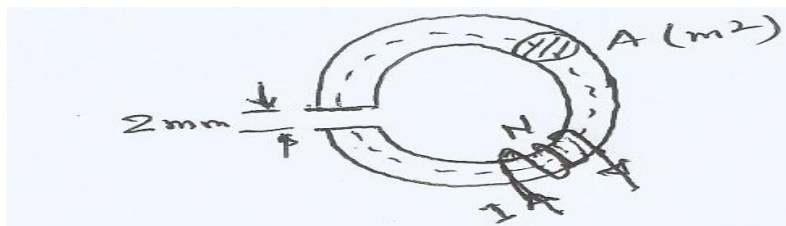
(4 + 5 + 5)

Q/3 a) A coil of resistance 30Ω and inductance 0.6 H is switched on to a 240 V supply. (a) Calculate the rate of change of current (i) at the instant of closing of the switch when $t = 0$ and (ii) at time $t = 2(L/R)$; (b) the magnitude of the final steady state current (7)

b) i) What is Sulphation in cells (battery)?

- ii) A 6 – cell, 12 volt battery is to be charged at a constant rate of 10 ampere from a 24 volt d.c. supply. If the EMF of each cell at the beginning and end of charging is 1.9 V and 2.4 V, what should be the value of maximum resistance to be connected in series with the battery. Resistance of the battery is negligible (3+4)

- Q) 4 a) What is a magnetic circuit?. Why a core is used in a magnetic circuit? Draw a simple magnetic circuit and in your circuit show Leakage flux, useful flux and fringing. What is leakage coefficient? (1 + 2 + 3 + 1)
- b) An Iron ring of mean length 30 cm, has an air gap of 2 mm and a winding of 200 Turns. If the permeability of the Iron is 300, when a current of 1 A flows through the coil, find the flux density. Draw the electrical analogue circuit for the magnetic circuit.



(7)

- Q/5 a) A coil of resistance 20Ω and an inductance of 60 mH is connected in series with a $130\mu\text{F}$ capacitor across a 230 V, 50 Hz supply. Calculate a) the impedance b) the Power factor of the circuit. c) the current flowing in it. d) the voltage across the coil. (7)

- b) What is a balanced 3 phase system? You have two watt meters and you are required to measure the power consumed by a three phase motor. Show the arrangement and justify your measurement. (2 + 5)

- Q/6 a) The four impedances of an a.c. bridge are $Z_1 = 300\Omega \angle 40^\circ$, $Z_2 = 200\Omega \angle 40^\circ$, $Z_3 = 400\Omega \angle 30^\circ$ and $Z_4 = 600\Omega \angle 50^\circ$. Find out weather the bridge is balanced Under these conditions or not. Justify your judgement (4)

- b) i) You need to measure insulation resistance of a coil, which is of the order of few $\text{M}\Omega$. Can you measure this resistance with a Multi meter? Justify your answer.
 ii) You have a PPMC type of instrument, which gives full scale deflection at 100mV p.d. and 50 mA current. How will you use it as an a) Ammeter of 0 – 60 range and b) Voltmeter of range 0-300 V. Draw the circuit for each case. (5 + 5)

Q/7 a) How the Diode rectify a.c. signals? Draw a diagram of a bridge rectifier (using 4 Diodes) to convert single phase a.c. supply into d.c. supply. Label your circuit showing the direction of current through the load. What is the significance of filters in the rectifier circuit. (2 + 4 + 1)

b) Differentiate between avalanche break down and zener breakdown. (7)

Q/8 a) What is a transistor? Draw a circuit diagram and explain the working of a NPN Transistor. (1 + 6)

b) For the common emitter NPN silicon transistor circuit shown in the figure below, determine the Q point and estimate I_{CQ} and V_{CEQ} when $V_{CC}=12\text{ V}$, $V_{BB} = 6\text{V}$, $R_C=150\ \Omega$, and $R_B = 88\ \text{K}\Omega$. (7)
