BRE-14-A

# INDIAN MARITIME UNIVERSITY

(A CENTRAL UNIVERSITY, GOVERNMENT OF INDIA)

**B.TECH (MARINE ENGINEERING)**

DECEMBER2014/JANUARY END SEMSTER EXAMINATION

I SEMESTER

**BASIC ELECTRICAL & ELECTRONICS ENGINEERING (T 2104 / T 1104)**

Time : 0300 Hrs
Date:31-12-2014

Max Marks : 100
Pass Marks : 50

**Part - A** (3×10 = 30 **Marks**)

**Compulsory Questions**

1) (a) A 6-Cell, 12-V battery is to be charged at a constant rate of 10A from a 24-V d.c. supply. If the e.m.f of each cell at the beginning and end of the charge 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.

(b) A Solenoid is wound with a coil of 100 turns. The coil is of length 50 Cm. and is carrying a current of 2 Amps. Determine the magnetic field strength at the line of the solenoid.

(c) Find the following parameters of a Voltage V= 200 Sin 300 t, (i) Frequency (ii) Form factor.

(d) Why is a controlling torque necessary in an analog indicating instrument? What would happen in the absence of a controlling torque?

(e) What is a transducer ? Differentiate between Active and Passive transducer.

(f) What is the function of an "Aquadag" coating in a CRT(Cathod ray tube) ?

(g) What is the significance of biasing in a P-N junction diode.?

(h) As regard Zener diode define zener voltage ($v_z$) and Zener current ($I_z$)

(i) Establish relationship between α and β in a transistor.

(j) Following current readings are obtained in a transistor connected in CB configuration. $I_E$ = 2 mA and $I_B$ = 20 μA. Compute the value of α & $I_C$.

**Part - B** (5×14 = 70 **Marks**)

**Answer Any Five of the following**

2) (a) State Maximum Power Transfer theorem. Prove that maximum power transferred to the load is $P_{Lmax} = E^2 / 4R_L$ where $R_L$ is the load resistance. (2+4)

(b) For fig. 1, using Thevenin's theorem, find the current in 8 Ω resistance. (8)

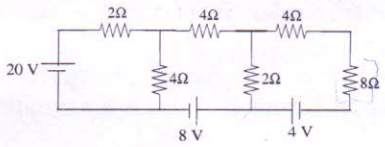


Fig. 1.

3) (a) Define Self inductance, mutual inductance and coefficient of coupling. Establish relationship between self inductance (L), mutual inductance (M) and co efficient coupling (K), i.e. $K = M/(L_1L_2)^{1/2}$. (3+4)

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(b) Define magnetic circuit.
A mild steel ring of circumference 50 cm and cross sectional area of $5cm^2$ has a coil of 250 turns wound around it. Calculate:
(i) The reluctance (ii) The current required to produce a flux of 700 μwb.
The relative permeability $\mu_r$= 380 (1+6)

4) (a) Enumerate the conditions for balanced load in a three phase system.
Derive the relationship between phase voltage and line voltage in a Star connected three phase system that is Phase voltage = Line voltage/ $\sqrt{3}$. (3+4)

(b) Explain the concept of root mean square value in A.C system.
Determine the inductance, reactance, impedance and power factor of a circuit which takes 10A and dissipates 1390 watt when connected across 250 volt 50 Hz main supply. (2+5)

5) (a) With a neat sketch explain the working of a PMMC (Permanent magnet moving coil) type ammeter. Can this instrument be used for measuring alternating current? Justify your answer. (5+2)

(b) How will you use a PMMC instrument which gives full scale deflection at 100 m V p.d. and 5 mA current as (i) Ammeter 0-50 A range (ii) Volmeter 0-200 V range. (7)

6) (a) State Blondel's theorem.
With the help of a circuit diagram explain how power can be measured in a 3Φ circuit with the help of two watt meters for a balanced star (Wye) connected load. Show the connection for the measurement of the wattmeter. (1+6)

(b) The arms of an A.C .Max well bridge are arranged as follows: AB is a non-inductive resistance of 1000 Ω in parallel with a capacitor of capacitance 0.5 μf , BC is a non- inductive resistance of 500 Ω . CD is an inductive impedance (un known) and DA is a non inductive resistance of 800 Ω. If balance is obtained under these conditions, find the value of the resistance and the inductance of the branch CD. (7)

7) (a) (i) What is intrinsic semiconductor? How can the connectivity of an intrinsic semiconductor be improved?

(ii) How does the energy band structure of a semiconductor differ from that of a conductor and an insulator? (1+2+4)

(b) How does a Zener diode differ from an ordinary diode? Define the following as applied to a PN Junction
(i) Depletion region (ii) Width of the barrier. Support your answer with neat diagram. (2+5)

8) (a) How do 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. What is the significance of filters in the rectifier circuit? (2+4+1)

(b) Write a short note on electron emission and give some applications of electron emission. (7)

9) (a) What is a transistor? Draw a circuit diagram and explain the working of a NPN transistor. (1+7)

(b) Define active, saturation and cut-off region of operation. (1+1+1)

(c) Explain how a transistor can act like a switch. (3)

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