

# RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

THIRD YEAR

B.A./B.SC. FIFTH SEMESTER (July – December) 2014

Mid-Semester Examination, September 2014

Date : 17/09/2014

PHYSICS (Honours)

Time : 2 pm – 4 pm

Paper : VI

Full Marks : 25

**[Use a separate answer book for each group]**

## **Group – A**

(Answer **any two** questions)

1. Write down the Maxwell's equations both in integral and differential forms and explain physical origin of each equation. [5]
2. A parallel plate capacitor C is discharging through a resistor R from its charged state with charge  $Q_0$ . Prove the continuity of the current in the circuit and the magnetic field within space of capacitor. [5]
3. State Poynting's theorem, Find the energy density of electromagnetic wave in terms of E and B. [5]

## **Group – B**

(Answer **any three** questions)

4. Give a block diagram of a feed-back amplifier. Give some of the advantages of negative feedback. [1+4]
5. Give an expression of voltage gain of negative feedback amplifier. Negative feedback is used to reduce the noise from an amplifier by 90%; what must be the percentage negative feedback to accomplish this, without feedback voltage gain is 100? [1+4]
6. What is virtual ground in an Op Amp? In an Op Amp signal current will not flow through input terminals, why? Show how an Op Amp can be used as an integrator. [1+1+3]
7. a) Derive an equation for AM wave. Show that AM wave contains two equally spaced side frequencies and one carrier wave frequency. [2+2]  
b) Define deflection sensitivity of a CRT. [1]
8. a) Draw a simple diode detector for demodulation of AM wave. Explain its working principle. [1+2]  
b) The aerial current of an AM radio station is 5A when the carrier only is transmitted. But it increases to 5.8A when the carrier is modulated. Find the percentage modulation. [2]

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