

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [2017-20]

B.A./B.Sc. THIRD SEMESTER (July – December) 2018

Mid-Semester Examination, September 2018

Date : 27/09/2018

PHYSICS (General)

Time : 12 noon – 1 pm

Paper : III

Full Marks : 25

(Answer any five questions taking at least one from each group)

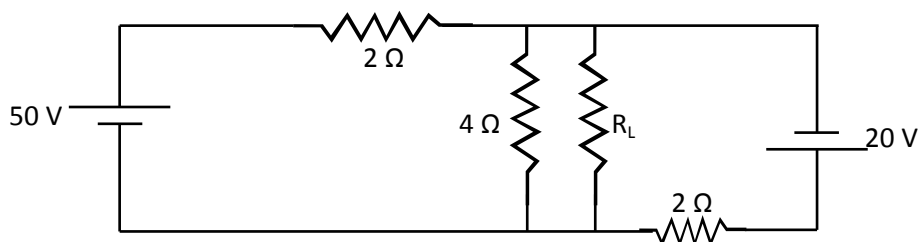
[5×5]

Group – A

1. Define different molar specific heats for ideal gas (C_v & C_p). Starting with the First law of Thermodynamics, prove that $C_p - C_v = R$, where R is the universal gas constant. [2+3]
2. What are the basic principles of operation of an 'engine' and 'refrigerator'? Regarding their operation, state the Clausius and Kelvin-Planck statement of second law of Thermodynamics. [3+2]

Group – B

3. Define polarisation of dielectric medium. Prove $\vec{D} = \epsilon_0 \vec{E} + \vec{P}$ for a dielectric medium. Where $\vec{D}$ is displacement vector, $\vec{E}$ is electric field and $\vec{P}$ is polarisation. [1+4]
4. Prove that small current loop behaves as magnetic dipole. [5]
5. Find the self inductance of a solenoid and hence find magnetic energy density of solenoid. [3+2]
6. Calculate the maximum power delivered to the load resistance R_L in the circuit given below. [5]



7. a) An ac source $v(t) = v_0 \sin \omega t$ is applied across a capacitor of capacitance C . Show that the current in the capacitor lead the voltage across the capacitor by 90° . What do you mean by capacitive reactance for this circuit. [2+1]
- b) An $8\mu\text{f}$ capacitor is connected to the terminals of a 60 Hz ac generator whose rms voltage is 150V. Find the capacitive reactance and the rms current in the circuit. [1+1]

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