Reg. No…….. **Name**…… **19U241**

B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH/APRIL 2019

SEMESTER – 2: PHYSICS (COMPLEMENTARY COURSE FOR MATHEMATICS)

COURSE: **15U2CPPHY3 – ELECTRIC AND MAGNETIC PHENOMENA, THERMODYNAMICS AND SPECIAL THEORY OF RELATIVITY**

(Common for Regular 2018/Supplementary-improvement 2017/2016/2015/2014 Admission)

Time: Three Hours Max. Marks: 60

PART A (Very short answer questions)

Answer all questions. Each question carries 1 Mark

1. Write down the Gauss's law in presence of a dielectric.
2. The departure of dielectric constant from unity is represented by which quantity?
3. What happens to diamagnetic materials, when placed in a magnetic field? Attracted or repelled?
4. What do you mean by an isochoric process?
5. Is it possible to convert heat energy completely to mechanical work in a process?
6. State the third law of thermodynamics.
7. What is length contraction in special relativity?
8. Write down Einstein's mass energy relation. (1 x 8 = 8)

PART B (Short Answer)

Answer any six questions. Each question carries 2 Marks

9. What are ferroelectric materials? Give an example.
10. Compare the properties of paramagnetic, diamagnetic and ferromagnetic materials in terms of their susceptibility and relative permeability.
11. What are the basic elements of a Carnot heat engine? List the processes involved in a Carnot engine.
12. Distinguish between reversible and irreversible processes. List the reasons for irreversibility of processes.
13. Discuss the concept of entropy. How is it related to the degree of disorder in a system?
14. Using Galilean transformation equations, prove that acceleration of a particle is the same in all inertial frames.
15. State the postulates of special relativity.
16. Explain what is meant by relativity of simultaneity. (2 x 6 = 12)

PARTC (Problem/Derivations)

Answer any four questions. Each question carries 5 Marks

17. Determine the polarization in a dielectric having dielectric constant 2.8 and electric displacement vector 3×10^{-7} coulomb/m^2.
18. The magnetization and magnetic flux density in a material is 2800 Am^{-1} and $28\pi\times10^{-4}T$, respectively. Calculate the magnetizing field intensity and permeability of the material.

19. Air at NTP is compressed adiabatically to half of its volume. What is the change in its temperature? Given, $\gamma = 1.4$.
20. Calculate the change in entropy when 0.0273 kg of ice at zero degree Celsius is converted into water at the same temperature. Given latent heat= 80 cal/g.
21. In a laboratory, the life-time of a particle moving with speed $2.8 \times 10^8 m/\sec$ is observed to be 2.5×10^{-7} sec. Determine the proper life-time of the particle.
22. Estimate the increase in relativistic mass of a particle of rest mass 1 gm when it is moving with velocity 0.8c. (5 x 4 = 20)

PART D (Essay)

Answer any two questions. Each question carries 10 marks

23. Discuss the origin of ferromagnetic domains. What do you mean by magnetic hysteresis? Draw a typical hysteresis curve and explain the terms retentivity and coercivity. How is the area of the hysteresis curve related to the energy dissipated per unit volume of the material during each magnetic cycle?
24. Explain the working and principle of heat engine and derive its expression for efficiency
25. What are the basic thermodynamic potentials? Obtain Maxwell's thermodynamic relations from the thermodynamic potentials.
26. Obtain the relativistic velocity transformation equations.

(10 x 2 = 20)

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