Reg. No……………………………………..   Name…………………………………………   **20U243S**

B. Sc. DEGREE END SEMESTER EXAMINATION – MARCH 2020

SEMESTER – 2: PHYSICS (COMPLEMENTARY COURSE FOR MATHEMATICS)

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

(For Supplementary / improvement 2018/2017/2016/2015/2014 admissions)

Time: Three Hours   Max. Marks: 60

PART A (Very short answer questions)

(Answer **all** questions. Each question carries 1 Mark)

1. Define polar and non-polar dielectrics
2. State first law of thermodynamics
3. Give an example of paramagnetic material
4. Write down the efficiency relation of heat engine
5. What is polarization?
6. What is meant by magnetic susceptibility?
7. How refractive index of a material is related to dielectric constant?
8. What is an adiabatic process?

(1 x 8 = 8)

PART B (Short Answer)

(Answer any **six** questions. Each question carries 2 Marks)

9. State and explain Gauss's Law in dielectrics
10. Explain postulates of special theory of relativity
11. Distinguish between Ferromagnetism and Ferrimagnetism
12. Mention Maxwell's thermodynamic relation
13. Explain the significance of indicator diagram
14. Define length contraction
15. What is hysteresis loop? Explain its significance.

(2 x 6 = 12)

PART C (Problem/Derivations)

(Answer any **four** questions. Each question carries 5 Marks)

16. A refrigeration unit is cooling a space to -5°C by rejecting energy to the atmosphere at 20°C. It is desired to reduce the temperature in the refrigerated space to −25°C. Calculate the minimum percentage increase in work required, by assuming a Carnot refrigerator, for the same amount of energy removed.

17. A spacecraft is moving relative to earth. An observer on the earth finds that, between 1 PM and 2 PM according to her clock, 3601 s elapse on the spacecraft's clock. What is the space craft's speed relative to earth?

18. A stationary body explodes into two fragments each of mass 1 kg that move apart at speeds of 0.6c relative to the original body. Find the mass of the original body.

19. A mixture of 1.78 kg of water and 262 g of ice at 0^0C is in a reversible process, brought to a final equilibrium state where the water/ice ratio by mass is 1:1 at 0^0C. calculate the entropy change of the system during this change.

20. State and explain curie's law in magnetism.

$$(5 \times 4 = 20)$$

PART D (Essay)
(Answer *two* questions. Each question carries 10 Marks)

21. Derive Maxwell's thermodynamic relations.

22. Explain the working and principle of Carnot engine and derive its expression for efficiency.

23. Deduce Lorentz transformation equations.

24. Deduce the expression $C_p - C_v = R$

$$(10 \times 2 = 20)$$

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