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PBC-003-001302 Seat No. _____

B. Sc. (Sem. III) (CBCS) Examination

November / December - 2018

Physics : Paper - 301

(Thermodynamics, Relativity, Electrostatic, Magnetostatic & Electronics)

(Old Course)

Faculty Code : 003

Subject Code : 001302

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Write answers of all questions in main answer book.
(2) All questions are compulsory.
(3) Symbols have their usual meaning.
(4) Marks of each question are indicated on right side.

1 Answer the following questions in brief : **20**

(1) What is elastic constant?
(2) If the Raynold number is above 3000, the flow of liquid is _____
(3) In any natural process the entropy _____
(4) Give formula for the efficiency of a heat engine.
(5) Who introduced quantum concepts for the explanation of blackbody radiation?
(6) A hot solid body in contact with a cold solid body loses energy by _____
(7) A body which can absorb all the radiations falling on it is known as _____
(8) How many electrons are in $10mC$ charge?
(9) Find the electric field E if the potential $V = 2x^2 - 16$ at $x = 2$ meters.

(10) Find the Coulombian force between charges of $2C$ and $5C$, $10cm$ apart.
(11) What is magnetic field? Give SI unit of magnetic field.
(12) Define the term Magnetic susceptibility.
(13) What is relative permeability? Give its unit.
(14) When a material particle attains speed equal to c, what will be the effect on its mass?.
(15) What is non inertial frame?
(16) What is the energy of $20\ gm$ of a substance upon its conversion into energy?
(17) On which characteristics the dc and ac load lines are drawn?
(18) What is the phase difference between i/p and o/p voltage and current of CE transistor configuration?
(19) Define stabilization of Q point.
(20) The ideal value of stability factor is _____.

2 (a) Answer any **Three** : (2 marks each) **6**

(1) Define the terms stress and strain
(2) State Stoke's law.
(3) Give entropy based statement of second law of thermodynamics.
(4) What is radiant heat?
(5) Derive the formula for potential energy of a capacitor.
(6) For a long straight charged wire with charge density of $0.01\,\mu C$, find the electric intensity at a point 0.1 meter from the conductor. $\left(\varepsilon_0 = 8.85 \times 10^{-12} C^2 / Nm^2\right)$

(b) Answer any **Three** : (3 marks each) **9**

(1) Write a note on capacitance of a parallel plate capacitor.
(2) State and prove the Gauss theorem.
(3) Explain the emissive power of a body for radiant heat.

(4) Give proof of Carnot theorem.

(5) Explain the work done of a gas at a constant pressure.

(6) Explain the terms streamline flow and turbulent flow.

(c) Answer any **Two** : (5 marks each) **10**

(1) Derive Poiseuille's formula for liquid flow.

(2) Derive the general expression for change in entropy.

(3) Discuss the Planck's law for black body radiation and derive Wein's and Rayleigh Jeans formula.

(4) Describe the electric field around a charged hollow sphere.

(5) Discuss the change of entropy for isothermal, adiabatic and reversible processes.

3 (a) Answer any **Three** : (2 marks each) **6**

(1) Define self and mutual inductance.

(2) Derive a formula for self inductance of a very long solenoid of length l, total number of turns N and cross sectional area A.

(3) Two particles travel with a speed of 0.9 c relative to lab. frame to collide with each other. Find their relative speed.

(4) Write a note on stability factor.

(5) Define dc and ac load lines.

(6) For a transistor amplifier with $R_C = 12K\Omega$, $R_L = 2K\Omega$, $\beta = 200$ and $R_{in} = 2K\Omega$. Calculate the voltage gain.

(b) Answer any **Three** : (3 marks each) **9**

(1) Derive the relationship $\mu_r = 1 + X_m$

(2) Explain the Hall effect.

(3) Explain 'time dilation'.

(4) Explain the frequency response curve of an amplifier.

(5) Explain the phase reversal in CE amplifier graphically.

(6) Discuss the fixed bias circuit.

(c) Answer any **Two** : (5 marks each) **10**

(1) Explain the voltage divider biasing in CE amplifier

(2) Explain hysteresis loop in detail.

(3) Describe the equivalence of mass and energy.

(4) Describe a practical circuit of transistor amplifier and give working of its components.

(5) For a silicon transistor in CE mode with voltage divider biasing, draw the dc load line and fix the Q point. Given $V_{CC} = 12V$, $R_1 = 10K\Omega$, $R_2 = 5K\Omega$, $R_C = 1K\Omega$, $R_E = 2K\Omega$ and $\beta = 50$.