**Internal Assessment Examination'2021**
**Semester-VI Honours Paper : CC13 Time: 30 minutes**

**Full Marks : 20**
**Answer any *ten* of the following questions** $10 \times 2 = 20$

1. Write down Fresnels equation for the case of polarization in the plane of incidence.
2. What is Brewster angle?
3. Write down boundary conditions for analyzing reflection at conducting surfaces.
4. Write down relation between components of $\vec{D}$ and $\vec{E}$ in terms of permittivity tensor in anisotropic media.
5. Write down difference between uniaxial and biaxial medium in terms of permittivity property in general dielectric.
6. Prove laws of reflection and Snells law for reflection and transmission at oblique incidence.
7. What is displacement current? How Amperes circuital law for steady current was modified to include displacement current?
8. Show that equation of continuity is contained in Maxwells equation.
9. Starting from Maxwells equation, derive the wave equation for electric and magnetic fields in free space.
10. What do you mean by Gauge transformation?
11. What is retarded potential?
12. Calculate the frequency at which the skin depth in sea water is 1 meter. Given $\sigma = 4.3$Mho/meter and $\mu = 4 \times 10^7$. H/m
13. What are uniaxial and biaxial crystals ?
14. What is double refaction ?
15. What are retardation plates ?
16. What is optical rotation?
17. State Biots Law for Rotatory Polarisation .
18. What is a half shade plate ?

**Internal Assessment Examination'2021**
**Semester-VI Honours Paper : CC14 Time: 30 minutes**

**Full Marks : 20**
**Answer any *ten* of the following questions** $10 \times 2 = 20$

1. What is black body?
2. Write down the Kirchhoffs law.
3. State the Stefan-Boltzmann law.
4. What is ultraviolet catastrophe?
5. Write down the Plancks law of radiation.
6. Define phase space and Gama space.
7. Mention thermodynamic parameters that remains unchanged in microcanonical ensemble.
8. Name the physical parameters which remain constant in thermal and mechanical equilibrium of two systems in thermal contact.
9. Calculate the partition function of an one dimensional linear harmonic oscillator.
10. Suppose out of N particles N1 particles are in $+\epsilon$ enegy state and N2 particles are in $-\epsilon$ enegy state. Show that maximum thermodynamic probability will be given by $\frac{N!}{(N/2!)(N/2!)}$ where $N = N1 + N2$ and $N_1 = N_2 = (N/2)$
11. All accessible states of a statistical system are microstates but the converse is not true. Why ?
12. Justify whether it is possible to draw the phase diagram of a statistical system consisting of indistinguishable particles.
13. An ideal gas with chemical potential $\mu$ and at a temperature T exchanges its particles with the surroundings. The average number of particles in a particular energy state $E$ of the gas is $n$. What are the conditions under which the classical and the quantum treatment to the gas should lead to the same expression of $n$ ?
14. Explain Bose-Einstein condensation in view of the grand partition function of an ideal Bose system.
15. Explain statistical bunching in view of the probability distribution of an ideal Bose system.

**Internal Assessment Examination'2021**
**Semester-VI Honours  Paper : DSE A2  Time: 30 minutes**

**Full Marks : 20**
**Answer any *ten* of the following questions** $10 \times 2 = 20$

1. What is neutral equilibrium?
2. What is normal modes of vibration?
3. What is body coordinate system?
4. Define products of inertia.
5. Write down the Eulers geometrical equations.
6. What is cyclic co-ordinate ?
7. Prove that the translational symmetry of a classical system corresponds to the conservation of linear momentum of the system.
8. What is functional ?
9. Prove that the Euler-Lagrangian equation can be written as $\frac{d}{dx}(f - y^{'}\frac{\partial f}{\partial x^{'}}) - \frac{\partial f}{\partial x} = 0$ . The symbols have their usual meanings.
10. . Give an example of holonomic constraint and explain.
11. Convert the equation $u^{"} + p(t)u^{'} + q(t)u = f(t)$ to a set of equations with first order differential coefficients. Dots represent differential coefficients with respect to t .
12. Find the equilibrium points and the general equation of the phase paths of the system $u^{"} + x - x^2 = 0$. Dots represent differential coefficients with respect to t .
13. How is it possible to know, quantitavely, the status of the equilibrium points of a nonlinear equation ?
14. How is it possible to identify the states of stable equilibrium of a dynamical system, from its phase diagram ?
15. How does the phase diagram of a pendulum indicate the possibility of a whirling motion

**Internal Assessment Examination'2021**
**Semester-VI Honours Paper : DSE B2 Time: 30 minutes**

**Full Marks : 20**
**Answer any *ten* of the following questions** $10 \times 2 = 20$

1. What are disadvantages of bipolar coding?
2. Draw the block diagram of PWM (pulse width modulation).
3. Explain what pulse amplitude modulation (PAM) is.
4. What are the advantages of cellular concept in mobile communication?
5. What is the difference between cell splitting and cell sectoring concept in mobile communication?
6. What does M-ary phase shift keying refers to?
7. Why carrier wave is needed in audio transmission?
8. What do you mean by band width in amplitude modulation?
9. Draw the circuit diagram of a diode envelope detector?
10. What is space wave transmission? Whats the relevant range of frequency?
11. Write down the frequency spectrum of amplitude modulated wave.
12. Consider an AM wave with 80 percent modulation. Calculate the percentage of power saved when a single band is transmitted instead of the total AM wave.
13. What are geosynchronous satellite orbits ?
14. What is satellite visibility ?
15. What are transponders ?
16. What is SIM Number ?
17. What is FDMA, TDMA ?
18. What are Uplink and Downlink Frequencies ?