(V01)

056/21

Total Number of Questions : 32

Time : 3.00 Hours

Max. Marks : 200

1. The kinetic energy of a body projected at the angle of maximum range is E. What will be its kinetic energy at the highest point of its path ? **(2 Marks)**

2. Find the height to which a ball dropped from a height of *h* m will rebound assuming the value of $g = 10\ m/s^2$ and the coefficient of restitution = 1. **(2 Marks)**

3. If R is the resistance, X_L and X_C the inductive and capacitive impedances in a series L-C-R circuit, find the impedance at resonance. **(2 Marks)**

4. If K_1 and K_2 are the thermal conductivities of two rods joined in series, what will be the effective thermal conductivity of the combination ? **(2 Marks)**

5. Write down the diode equation and explain the symbols used. **(2 Marks)**

6. What is the difference between an amplifier and an oscillator ? **(4 Marks)**

7. Give the truth table for the universal logic gates. **(4 Marks)**

8. Write down the Maxwell's electromagnetic field equations. **(4 Marks)**

9. Explain the principle employed by an acrobat. **(4 Marks)**

10. Explain the Bragg's diffraction condition and name any two X-ray diffraction methods. **(4 Marks)**

11. Show that the capacitance of a parallel place capacitor is proportional to the area of the plates. **(5 Marks)**

12. We know that the refractive index $n = \sqrt{\epsilon_r}$. Relative permittivity of water is 80.37 at room temperature. But the refractive index of water is 1.33 at room temperature. Explain the reason. **(5 Marks)**

13. Explain the formation and difference between primary and secondary rainbow. **(5 Marks)**

14. Show that the side band power is 33.3% of the total power in AM waves. **(5 Marks)**

15. Explain the reason for using oils for frying. Why water cannot be used ? **(5 Marks)**

16. In cold countries pipes with oval cross sections are used for carrying water. Why ? **(5 Marks)**

17. Explain the perpendicular axis theorem in moment of inertia. **(5 Marks)**

18. Show that electrons cannot stay inside a nucleus using uncertainty principle. **(7 Marks)**

19. What is the principle of hydrogen bomb ? **(7 Marks)**

20. Explain Doppler Effect. How is it employed in Astrophysics ? **(7 Marks)**

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21. Explain the principle and working of pile of plates. **(7 Marks)**

22. What is the significance of V number ? Obtain its expression. **(7 Marks)**

23. Show that it is not possible to have a two level laser system. **(10 Marks)**

24. Explain Young's modulus and show that a shear is equivalent to a compression and extension. **(10 Marks)**

25. What is Meissner effect ? Also explain type I and type II superconductors. **(10 Marks)**

26. Explain the classical theory of Raman Effect. Why stokes lines are more intense than anti-stokes lines ? **(10 Marks)**

27. If you are given two pieces of ice blocks how will you join them. Explain it on the basis of Clausius-Clapeyrons equation. **(10 Marks)**

28. Explain length contraction in special theory of relativity. **(10 Marks)**

29. What is electric potential ? Show that it can be expressed as the line integral of electric field. **(10 Marks)**

30. Explain the concept of ensembles. What are the different types of ensembles ? **(10 Marks)**

31. Derive one dimensional time dependent Schrodinger equation for a particle moving in free space. **(10 Marks)**

32. Obtain the expression for the voltage gain of a negative feedback amplifier and show that how it improves the gain stability. **(10 Marks)**