VCD 31/10/23 SYBSC SEM III PHYSICS III 2.30 Hrs 75 Marks

Note: (1) All questions are compulsory.

(2) All questions have internal choice.

(3) Figure to the right indicates full marks.

Q1]A] Answer the following questions:- (Any One) [10M]

1) The EMF equation for charging circuit is already given. Using that derive an expression for the charge on the capacitor. The initial charge on the capacitor is zero.

2) *Solve the equation:* – i) $\frac{dy}{dx} = \frac{y+2}{x+3}$ ii) $\frac{dy}{dx} = \frac{x}{e^y}$

Q1]B] Answer the following questions:- (Any Two) [10M]

1) *Solve the equation:* – $\frac{d^2y}{dx^2} + 36y = 0$

2) If N is the number of radio-nuclei in a sample at time t , then the rate of radioactive decay is $\frac{dN}{dt} = -\lambda N$ where λ is called the decay constant. Solve the equation.

Given:- N_o is the initial number of radionuclei in the sample.

3) *Solve the equation:* – $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 8y = 0$

4) Consider a spring of spring constant k whose one end is fixed and a mass m hangs from the other end. The mass is pulled down a little through a vertical distance y and released .Neglecting air resistance , set up the equation of motion of the mass m and solve it to show that the motion is oscillatory.

Q2]A] Answer the following questions:- (Any One) [10M]

1) The infinitely long uniform metal plate is enclosed between lines y=0 & y=l for x>0.The temperature is zero along the edges y=0 & y=l & at infinity.If the edges x=0 is kept at a constant temperature u_o , find the temperature distribution u(x,y).

2) Form the PDE from:- i) $x^2 + y^2 + (z - a)^2 = b^2$ ii) $ax^2 + by^2 + z^2 = 1$

Q2]B] Answer the following questions:- (Any Two) [10M]

1) Solve the equation $\frac{\partial u}{\partial t} = c^2 \left(\frac{\partial u}{\partial x}\right)$ with boundary conditions u (x,0)=3 sin nπx , u (0,t) , u (l,t) =0 where 0<x<l.

2) State the assumptions of modelling of vibrating stretched string.

3) State Partial Differential Equation. List some commonly used partial differential equations in Physics.

4) Derive PDE by eliminating arbitrary function:- z = axy + b

Q.3]A] Answer the following questions:- (Any One) [10M]

i) Explain the factors affecting the acoustic quality of the building.

ii) Obtain an expression for an Amplitude modulated signal.

Q.3]B] Answer the following questions:- (Any two) [10M]

i) Define reverberation time. State Sabine's formula for reverberation time.

ii) What is the Farthest distance from a 81 m high transmitting tower another tower of the same height should be erected for effective line of sight communication?

iii) Distinguish between Analog and Digital signals.

iv) What are the advantages of modulated signals?

Q4] Answer the following questions:- (Any Three) [15M]

1) Form the PDE by eliminating arbitrary function :- $z = f(x^2 + y^2)$

2) *Solve the equation*: $-\frac{d^2y}{dx^2} - 10\frac{dy}{dx} + 25y = 0$

3) Derive PDE from :- $(x-h)^2 + (y-k)^2 + z^2 = a^2$

4) *Solve the equation*: $-$ *i)* $\frac{dy}{dx} - \frac{y}{x+3} = \frac{2}{x+3}$

5) An auditorium of volume 5500 m^3 is found to have a reverberation time of 2.3 sec. The sound absorbing surface of the hall has an area of 750 m^2. Calculate the average absorption coefficient.

6) The amplitude of a wave 10 sin 47.3 x 10^4 t is modulated by a wave 3 cos 6280t. Find the equation of the modulated wave. The A.M. propagation factor is 1.

-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-

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