ASSIGNMENT - 5

AS-1)

CLASSICAL BITS	QUANTUM BITS
• The device computes by manipulation those bits with the help of logic gates	• The device computes by manipulating these bits with the help of Quantum logic gates.
• A classical computer has a memory made up of bits where each bits hold either a one or zero	• Quantum bits are used in quantum computers.
• classical bits are slow	• Quantum bits are fastr.
• Its circuit behaviour based on classical physics	• It circuit behaviors based on quantum mechanics

AS-3) a) let $C_1\Phi_1 + C_2\Phi_2$ be the linear combination that is orthogonal is Φ, then since Φ, is normalised.

$$\int \Phi^* (C_1\Phi_1 + C_2\Phi_2) d\tau = C_1 + C_2 d = 0 \quad - (i)$$

$$\therefore \frac{C_1}{C_2} = -d$$

Separate values of C_1 & C_2 are obtained from the requirement that is $C\Phi_1 + C_2\Phi_2$ be normalised. Take C_1 and C_2 to be real.

$$\int (C_1\Phi_1 + C_2\Phi_2)^* (C_1\Phi_1 + C_2\Phi_2) d\tau$$

$$= C_1^2 + C_2^2 + 2dC_1C_2 = 1 \quad \text{---} \quad (2)$$

from eqn (1) & (2)

$$C_1 = \frac{d}{\sqrt{1-d^2}} \quad -(3) \quad \therefore C_2 = \frac{-1}{\sqrt{1-d^2}} \quad -(4)$$

$(\phi_1 - \phi_2)/\sqrt{1-d^2}$

This given resulting expressions for c_1 & c_2 which are a valid solution.

This leads to the result that if f is normalised and orthogonal to g; so is exp.(iδ)f

(b) let $c_1\phi_1 + c_2\phi_2$ be normalised & orthogonal

Condition →

$$\int (\phi_1+\phi_2)^*(c_1\phi_1 + c_2\phi_2)\,dx = (c_1+c_2)(1+d) = 0$$

$$\therefore c_1 = -c_2$$

Normalising conditioning given (i)nd eqn as before.

from ② & ①

$$(\phi_1 - \phi_2)/\sqrt{2-2d} \quad -(6)$$

$\therefore$ (6) has the required properties

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AS-2) $|\psi\rangle = \frac{1}{\sqrt{5}}|\mu_1\rangle - i\sqrt{7/15}|\mu_2\rangle + \frac{1}{\sqrt{3}}|\mu_3\rangle$

Normalised condition

$\langle\psi|\psi\rangle = 1$ or

Sum of square of constants = 1

$\rightarrow \left(\frac{1}{\sqrt{5}}\right)^2 + \left(-i\sqrt{7/15}\right)^2 + \left(\frac{1}{\sqrt{3}}\right)^2 = 1$

$\frac{1}{5} + \frac{7}{15} + \frac{1}{3} = 1$

Hence the given state is normalised.

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Ans-4) The surface to volume ratio of material or substance made of new-particle has a significant effect on the properties of the material. Material made-up of nano-particle have relation large surfaces area when compared to the same volume of material made up of bigger particles. It means that surface-volume ratio increases as radius of sphere decrease and vice-versa. Material made up of nano-particle have much greater surface area per unit volume ratio compared to material made of bigger particles.

Quantum confinement is charge of electronic and optical properties when the material sample is of sufficiently small size of typically 10 nano-meter or less. Band Gap Increases as size of nano-structure decreases. It is the spatial confinement of electron-hole excitation in one or more dimension within a material

1D confinement : Quantum well
2D confinement : Quantum wire
3D confinement : Quantum dot