

T.Y.B.Sc: Physics: Paper-II

Duration: 3 hrs

Total Marks: 100

- N.B. (1) Figures to the right indicate full marks.
(2) All questions are compulsory.
(3) Use of non programmable calculator is allowed.
(4) Symbols have their usual meaning unless stated otherwise.

Q.1] Attempt any two 20

- (i) Find the following differential equation for exactness, and solve the equation.

$$(4x^3+6xy+y^2)dx + (3x^2+2xy+2)dy = 0$$

- (ii) Expand $f(x) = x^2$ for $-\pi \leq x \leq \pi$ in a Fourier series.

- (iii) Find the Fourier transform of

$$f(x) = 1, |x| \leq a$$

$$f(x) = 0, |x| \geq a$$

Q.2] Attempt any two 20

- (i) Consider two interactive systems A and A'. They are neither adiabatically isolated nor their external parameters are kept fixed. Show that in equilibrium the temperature and pressure on both sides of the partition become equal.

- (ii) Derive Maxwell Boltzmann distribution law. Evaluate α and β .

- (iii) In case of transition between the two energy levels in an atom, show that the probability of absorption is proportional to N_v , while that of emission is proportional to $(N_v + 1)$ where N_v is the average number of photons in each quantum state.

Q.3] Attempt any two 20

- a)
b)
c)

- Q.4] Attempt any two 20**
- (i)
(ii)
(iii)
- Q.5] (A) Any Three 15**
- (i) State and explain Parseval's relation.
- (ii) Consider a system of four spin half particles fixed in space and placed in magnetic field B. Each particle has magnetic moment μ_0 associated with it. Find the various macro states in the system. Find number of microstates in each macrostate. Which macrostate is most Probable?
- (iii)
(iv)
- (B) Attempt any One 3**
- (i) Derive an expression for the growth of current in an LR circuit.
(ii)
- (C) Attempt any One 2**
- (i) Define Thermal interaction and adiabatic interaction
(ii)

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