B. N. Bandodkar College of Science, Thane.
Department of Physics

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

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 Nv, while that of emission is proportional to (Nv +1) where Nv 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**

(i) Define Thermal interaction and adiabatic interaction **2**

(ii)

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