Third Year B.Sc. Degree Examination, November 2008
PHYSICS
Paper – IV : Nuclear Physics, Solid State Physics and Electronics
(Directorate of Distance Education Course)
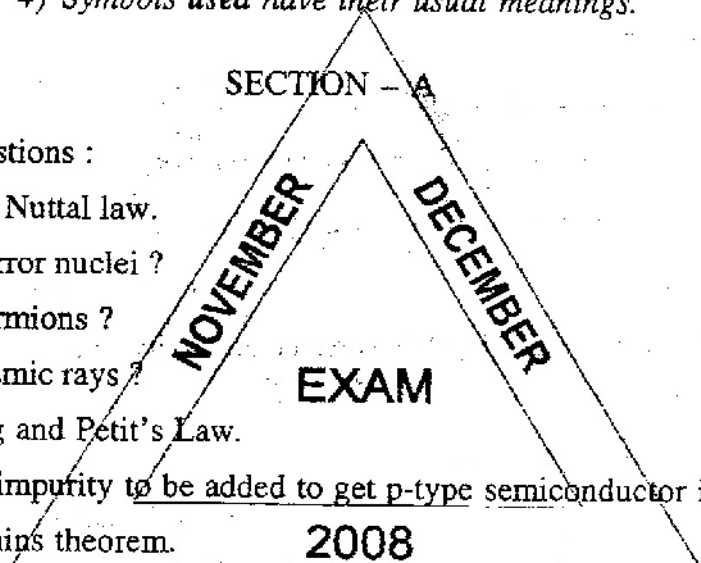
Time : 3 Hours   Max. Marks : 75

Instructions : 1) The question paper consists of 4 Sections A, B, C and D.
2) Answer all Sections.
3) Draw **neat** and labelled diagrams wherever necessary.
4) Symbols used have their usual meanings.

SECTION – A

I.   Answer all questions :   (10×1=10)

1) State Geiger Nuttal law.

2) What are mirror nuclei ?

3) What are Fermions ?

4) What are cosmic rays ?

5) State Dulong and Petit's Law.

6) The type of impurity to be added to get p-type semiconductor is ....

7) State Thevenins theorem.

8) RADAR stands for ....

9) Positive feed back is used in ....

10) Name the primary colours of T.V.

SECTION – B

II.   Answer any FIVE questions :   (5×3=15)

11) What is Radioactive equilibrium ? What are mesons ? What is the Q-value of nuclear reaction ?

12) What are the characteristics of nuclear forces ?

13) Explain the shell model of nucleus.

P.T.O.

14) Describe the construction and working of solar cells.

15) Explain why the contribution of electrons to the Sp heat of metals is insignificant.

16) Explain with a diagram how a zener diode is used as a voltage regulator.

17) The frequency of a Hartley oscillator is 25 KHz. If the capacitance of the capacitor used is 450 PF, calculate the inductance.

SECTION – C

III. Answer any FIVE questions : (5×6=30)

18) Describe with necessary theory working of cyclotron.

19) Arrive at four factor formula for a nuclear reactor.

20) What are the basic interactions in nature ? Explain Quack model of hadrons.

21) What is a phonon ? Explain in brief Debye's theory of specific heat of solids.

22) What are Miller Indices ? Explain super conductivity. What is Meissner effect ? What is SQUID ?

23) a) Give the analysis of Amplitude-modulation.

   b) The carrier frequency of an FM wave is 80 KHz, calculate the modulation index for a signal of frequency 8 KHz, with frequency deviation 24 KHz.

24) a) What is Hall effect ?

   b) Derive an expression for Hall co-efficient.

SECTION – D

IV. Answer any TWO questions : (10×2=20)

25) a) Explain the construction and working of a G.M. counter.

   b) The ratio of the mass of Pb^{208} to the mass of U^{238} in a certain rock specimen is found to be 0.5. Assuming that the rock originally contained no lead. Estimate its age. Half life of uranium is 4.5×10^9 years.

26) a) Explain altitude and latitude effect of cosmic rays.

b) What is α-decay ? Give the Gamow's theory of α-decay.

c) Show that the mass of Ra^{226} with an activity of one curie is almost 1 gm. Half life of Ra^{226} is 1600 years.

27) a) Obtain an expression for electrical conductivity of a metal on the basis of classical free electron theory.

b) Calculate the drift velocity of free electrons in a conductor of diameter 2 mm given the electron density to be 10^{28} per m^3, when a current of 5A flows in it.

28) a) Describe full adder by using logic gaters with necessary truth tables.　　　　6

b) For the circuit given below find the Norton current and the shunt resistance and draw the Norton's equivalent circuit, also find the current through the load resistance R_L.　　　　4