Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/BNS/SEM-2/BNS-202/2012

2012

NAUTICAL PHYSICS AND ELECTRONICS

Time Allotted : 3 Hours   *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words
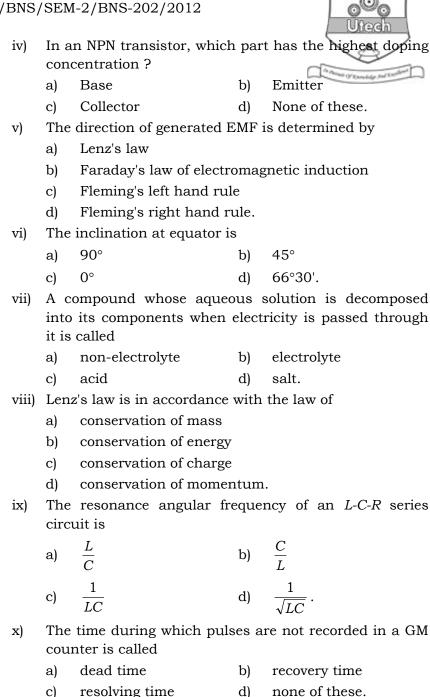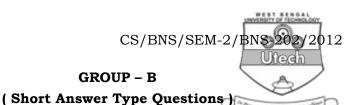
as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1.   Choose the correct alternatives for the following : $10 \times 1 = 10$

   i)   In *N*-type semiconductor fermi level energy lies

      a)   at the midway of valence band and conduction band

      b)   near to valence band edge

      c)   near to conduction band edge

      d)   none of these.

   ii)   The half-life of a radioactive element is 60 days. The average life of element is

      a)   75·6 days   b)   82·86 days

      c)   86·58 days   d)   30 days.

   iii)   Which one is a vector quantity ?

      a)   Magnetic flux   b)   Electric current

      c)   Magnetic flux density d)   Electric charges.

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iv) In an NPN transistor, which part has the highest doping concentration ?

    a)   Base   b)   Emitter

    c)   Collector   d)   None of these.

v) The direction of generated EMF is determined by

    a)   Lenz's law

    b)   Faraday's law of electromagnetic induction

    c)   Fleming's left hand rule

    d)   Fleming's right hand rule.

vi) The inclination at equator is

    a)   90°   b)   45°

    c)   0°   d)   66°30'.

vii) A compound whose aqueous solution is decomposed into its components when electricity is passed through it is called

    a)   non-electrolyte   b)   electrolyte

    c)   acid   d)   salt.

viii) Lenz's law is in accordance with the law of

    a)   conservation of mass

    b)   conservation of energy

    c)   conservation of charge

    d)   conservation of momentum.

ix) The resonance angular frequency of an *L-C-R* series circuit is

    a) $\dfrac{L}{C}$ b) $\dfrac{C}{L}$

    c) $\dfrac{1}{LC}$ d) $\dfrac{1}{\sqrt{LC}}$.

x) The time during which pulses are not recorded in a GM counter is called

    a)   dead time   b)   recovery time

    c)   resolving time   d)   none of these.

GROUP – B
(Short Answer Type Questions)
Answer any *three* of the following.　　3 × 5 = 15

2. What is electrolysis ? State Faraday's law of electrolysis.

3. What are the different types of DC generators ? Draw the circuit diagram.

4. What is nuclear fission ? How can a fission chain reaction be controlled ?

5. State the chemical changes taking place in the cathode and anode of lead-acid cell.

6. Sketch the relation between dip and latitude.

7. Explain with example the following terms :

   isotope, isobar, isotones and mirror nuclei.

   Name the different isotopes of hydrogen.

GROUP – C
(Long Answer Type Questions)
Answer any *three* of the following.　　3 × 15 = 45

8. a) Derive the EMF equation of a single phase transformer.

   b) Draw the equivalent circuit of a single phase transformer and describe all the parameters of the equivalent circuit.

   c) A 25 kVA transformer has primary turns 4000 and secondary turns 400. The primary is connected to 3·3 kVA, 50 Hz supply. Find the full load primary and secondary EMF and the maximum flux of the core.

9. a) What is photodiode ? How it can be used as photo-detector ?

   b) Explain the working principle of LED.

   c) What do you mean by photoelectric effect ? Write the Einstein's photoelectric equation explaining each term.

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10. a) Discuss the difference between Avalanche and Zenner Breakdown.

    b) Define self inductance and mutual inductance.

    c) What is radioactive carbon dating ?

11. a) What are the elements of earth's magnetism ? Explain their meaning by a diagram.   6

    b) What do you mean by Magnetic storm and Annular variation of earth's magnetism ? What is meant by inclination of Kolkata 30° N ?   5

    c) Draw the circuit diagram of a common emitter configuration of an *n-p-n* transistor.   4

12. a) Show that energy stored in an inductive coil is $\frac{1}{2}LI^2$, where L and I are the coefficients of self-inductance and current through the coil respectively.   4

    b) A current of 0·5 A was passed through a solution of $CuSO_4$ for two hours. Calculate the mass of copper deposited on the cathode. Electrochemical equivalent of copper is $3 \cdot 294 \times 10^{-7}$ kg/C.   4

    c) The half life of a radioactive substance is 2·5 days. Calculate the percentage of original materials left after 7·5 days.   4

    d) Define coefficient of coupling.   3

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