DIPLOMA IN NAUTICAL SCIENCE

Term-End Examination

June, 2007

BNA-013 : ELECTRICITY AND ELECTRONICS

Time : 2 hours *Maximum Marks : 70*

Note :

(i) Non-programmable scientific calculator is allowed.

*(ii) Attempt **three** questions from each section in all.*

*(iii) Questions no. 1 and 5 are **compulsory**.*

SECTION A (Electricity)

1. (a) Explain principle, construction and working of a transformer. Briefly explain step-up and step-down transformer. *10*

(b) A step-down transformer is used on 220 V supply to provide a current of 5 amp to a 60 watts bulb. If the secondary has 24 turns, find the number of turns in the primary and the current that flows in it. *5*

*Attempt any **two** from the following three questions.*

2. (a) Define the following terms : *5*

(i) Watt

(ii) emf

(iii) Temperature coefficient of resistance

(iv) Average value of resistance

(v) Form factor

(b) If the rms current in 50 Hz sinusoidal a.c. is 10 amp, determine 5

(i) Peak value of alternating current

(ii) Average value of alternating current

(iii) Form factor

(iv) The value of current 1/150 sec. after it was zero

3. (a) Explain briefly construction and working of an A.C. generator. 5

(b) If a copper wire is stretched to make it 15% longer, what is the percentage change in its resistance ? 5

4. (a) State and explain Kirchhoff's Current Law. Why Kirchhoff's Current Law is called as "Law of Conservation of Charge" ? 5

(b) What is the force on a wire of length 0·015 m carrying current 0·75 amp, placed inside a long, straight solenoid near its centre and making an angle of 30° with the axis of the solenoid ? The number of turns per unit length of the solenoid is 20 and it carries a current of 0·3 amp. 5

SECTION B (Electronics)

5. (a) Explain V – I characteristics of a junction diode. *10*

(b) A tungsten wire of unknown composition emits 0·3 amp/cm^2 at a temperature of 2100 °K. Find the work function of tungsten filament.
(Given : A = 60·2 amp/cm^2/°K^2) *5*

*Attempt any **two** from the following three questions.*

6. (a) Explain briefly common emitter amplifier with necessary circuit diagram. *5*

(b) A tuned collector oscillator operates at 2·2 MHz frequency. At what frequency will it work if its tuned circuit capacitance is reduced by 50% ? *5*

7. (a) How can zener diode be used as voltage stabilizer ? Explain with necessary circuit diagram. *5*

(b) A full wave rectifier uses two diodes of forward resistance 20 Ω each. The transformer rms secondary voltage from centre tap to each end of secondary is 30 V and load resistance is 980 Ω. Find

(i) d.c. current

(ii) rms current

(iii) efficiency of rectification *5*

8. Write short notes on any ***two*** of the following : $5 \times 2 = 10$

(i) Need for modulation

(ii) Capacitor filter

(iii) Half adder

(iv) Loop antenna

(v) Kirchhoff's voltage law