DIPLOMA IN NAUTICAL SCIENCE

Term-End Examination

December, 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.*

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

(iv) *In all you have to attempt **six** questions.*

SECTION A (Electricity)

1. (a) With the help of a neat diagram explain the principle, construction and working of an A.C. generator. Which component of the D.C. generator has to be changed in order to convert it into an A.C. generator ? *10*

(b) When a galvanometer having 20 divisions scale and 100 Ω resistance is connected in series to a battery of e.m.f. 2 volt through a resistance of 100 Ω, it shows full scale deflection. Find the figure of merit of the galvanometer in micro ampere. *5*

2. (a) State and explain Kirchhoff's laws with examples. *5*

(b) A lamp load of 2000 Ω resistance is connected across the DC supply of 50 V. What is the power absorbed in the lamp and what amount of heat will be released in 10 sec ? *5*

3. (a) List various types of switches used in electrical circuits and explain any one of them. 5

(b) A 440 V – 110 V, 60 Hz single-phase, marine type, step down transformer is designed to work with 1·5 V per turn with a flux density of 1·355 T.

Calculate :

(i) the required number of turns on the primary and secondary windings.

(ii) the cross-sectional area of the iron core. 5

4. (a) Write short notes on any ***two*** of the following : 5

(i) Electrical resonance

(ii) Moving coil galvanometer

(iii) Transformer

(b) A moving coil meter has a resistance of 4 Ω and gives full scale deflection with 20 mA. How can it be used to measure voltage upto 250 V ? 5

SECTION B (Electronics)

5. (a) With the help of a neat circuit diagram, explain the working of a basic transistor oscillator. *10*

(b) A full wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 25 Ω. The transformer r.m.s. secondary voltage from centre tap to each end of the secondary is 50 V and load resistance is 975 Ω. Find (i) the mean load current and (ii) the r.m.s. value of load current. *5*

6. (a) What is electron emission ? Explain any one type of electron emission. *5*

(b) The current gain of a transistor in a common base arrangement is 0·9. Find the voltage gain and power gain if the load resistance of output circuit is 300 kΩ and the input resistance is 150 Ω. *5*

7. (a) Explain the working of full wave bridge rectifier with necessary circuit diagram. *5*

(b) A tungsten filament consists of a cylindrical cathode 4 cm long and 0·04 cm in diameter. If the operating temperature is 2720 K, find the emission current. *5*

(Given : $A = 60{\cdot}3 \times 10^4$ amp/m^2/K^2 and
$\phi = 3{\cdot}26$ eV)

8. (a) Explain the working of a super-heterodyne receiver with a block diagram. *5*

(b) Write short notes on any ***two*** of the following : *5*

(i) Temperature transducer

(ii) Capacitor filter

(iii) Semiconductor