2017
MATRICULATION EXAMINATION
DEPARTMENT OF MYANMAR EXAMINATION

PHYSICS   **Time Allowed: (3) Hours**

WRITE YOUR ANSWERS IN THE ANSWER BOOKLET
The symbols in this paper have their usual significance

SECTION (A)
(Answer **ALL** questions)

1. Fill in the blanks.   (4 marks)
   (i)   In the British system, the practical unit of power is ....
   (ii) The waves produced by the violins are called .... waves.
   (iii) A ray of light is a stream of ....
   (iv) The SI unit for radioactivity is ....

2. Are the following statements **True** (or) **False**?   (4 marks)
   (i)   The pressure exerted by the column is dependent of the base area.
   (ii) Sound with very high intensities can be dangerous.
   (iii) The refractive index of diamond is larger than that of liquid medium.
   (iv) The filament in the vacuum diode is used as a source of electrons.

3. Define power. Is it a vector?   (4 marks)
   A crane is lifting a 412.5 lb piano with a velocity of 2 fts^{-1}. Express the power
   of the crane in hp.

4. In Thomson's model, is there a nucleus inside the atom?   (4 marks)
   Sketch the experimental setup of Rutherford's alpha scattering experiment.

5. In a warm room, an animal's body has a skin temperature of 33°C. If the room   (4 marks)
   temperature is 29°C and the surface area of the body is 1.5 m^2, what is the rate
   of heat loss due to convection?
   (Assume q = 1.7×10^{-3} Wm^{-2} K^{-1})

6. Show the ray diagrams using a totally reflecting prism 90° and 180° deviation   (4 marks)
   cases. What is the percentage of light reflected? Where are they used?

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7. What are the sources of electromotive force? Draw a circuit diagram consisting of two parallel resistors R_1 and R_2, an ammeter 'A' and a battery of electromotive force (e.m.f.) 'E' with internal resistance 'r'. Using Ohm's law, write out an expression for current I that flows in the circuit. (4 marks)

8. If the magnitude of the electric field intensity at a point 9 m from a charge (+Q) is 2×10^3 NC^{-1}, find the magnitude of that charge and the electric potential at that point. $(K = 9 \times 10^9 \, Nm^2C^{-2})$ (4 marks)

9. Suggest how two NOT gates and a NAND gate can be constructed to behave as an OR gate. Check it using the truth table. (4 marks)

(OR)

What is a nuclear reaction? Write down the equation in which the mass change m (kg) is linked to the energy change E (joules). What is the principal part of the cathode ray oscilloscope (CRO)? Give one of the uses of CRO. (4 marks)

SECTION (B)
(Answer any **FOUR** questions)

10. (a) Write down Pascal's law. Why is it a very useful law for practical purposes? Can you obtain the density of substance using Archimedes' principal?
The weight of a body in its normal (standard) condition is 400 N and the weight is 300 N when it is immersed in water. Find the density and volume of the body. (Density of water = 1000 kgm^{-3}) (8 marks)

(b) (i) State Stephan-Boltzmann's law. What do you understand by a black body? How can heat be transmitted from the sun to the earth? Why is the weather fair in a coastal region? (8 marks)
(ii) If the mass of a violin string of 1 m length is 0.3 g and its tension is 48 N, find the fundamental frequency and the velocity of the wave in the string.

11. (a) Write down the lens-makers' equation. Express the relationship between the focal length and power of a lens. Mention one of the uses of Snell's law. When light passes through two media of different optical densities, which parameter of light will be changed? A cube of ice of refractive index 1.31 is placed on the glass of refractive index 1.6. If a ray of light passing from the glass slab to the ice has an angle of incidence of 35°, will the total internal reflection take place? (8 marks)

(b) What is a prism? Draw a clear diagram to illustrate what is meant by dispersion of white light. An object 1.05 cm tall is 80 cm away from the screen and the size of its image on the screen is 0.35 cm. Find the position, type of the lens and its focal length. (8 marks)

12. (a) Why is Coulomb's law called an inverse square law? Calculate the electric field intensity on a charge (+q) at a distance (r) from a charge (+Q), using Coulomb's law. How far apart are the two electrons if the force each exerts on the other is equal to the weight of an electron? ($K = 9 \times 10^9$ Nm^{2}C^{-2}, $g = 10$ ms^{-2}, mass of electron $= 9.1 \times 10^{-31}$ kg, charge of electron $= 1.6 \times 10^{-19}$ C) (8 marks)

(b) Which devices are used to measure very small currents? What is an electromagnet? Give two uses of it. A carbon nucleus has a charge of $+ 6e$. Find the electric potential and electric field intensity at a point 10^{-12} cm from the nucleus. ($e = 1.6 \times 10^{-19}$ C, $K = 9 \times 10^9$ Nm^{2}C^{-2}) (8 marks)

13. (a) What is an equipotential surface? Which is more fundamental, the resistance or resistivity? Explain. Express the relationship between the practical unit of electrical energy and SI unit of work. A 2 Ω resistor is to be made from 100 cm^3 of copper, of resistivity 1.7×10^{-8} Ωm. If the copper is drawn into a wire of circular cross-section, what is its diameter? (8 marks)

(b) Write down the unit named in honour of Michael Faraday. What is the relationship between capacitance, voltage and charge? Express the equivalent resistances of three resistors (R_1, R_2, R_3) which are connected in parallel and in series. How much work must be done to charge a 12 μF capacitor until the potential difference between its plates is 150 V? Find the magnitude of charge on each plate. (8 marks)

14. (a) Express one electronic device that uses the principal of thermionic emission? Why can a transistor be regarded as a current amplifier? How do you understand by the term integrated circuits? Give two examples of the systems of logic gates. Describe the three electrodes of a transistor and the transistor current equation for a biasing circuit of a pnp transistor. (8 marks)

(b) Who discovered X-rays? Draw the schematic diagram of a X-ray tube and label its parts.
Give the similarities between X-rays and gamma rays. (8 marks)

15. (a) Define radioactivity. Which one is the heaviest isotope of hydrogen (8 marks) atom? Can the age of living plants and animals be determined by using carbon dating method? Give a substance which is used as a moderator in a nuclear reactor.

Draw the magnetic lines of force around a wire carrying a current I by using right hand rule. Show that the magnetic field of a solenoid is identical with that of a bar magnet, using the diagrams.

(b) Write down the units of electric potential energy and electric potential. (8 marks) Why is electrical energy transformed into heat energy when a current flows through a resistor? Why are the copper rods used as lighting conductors?

When a battery is connected to a 2 Ω resistor, it drives a current of 0.6 A through the resistor. When it is connected to a 7 Ω resistor, it drives a current of 0.2 A through the resistor. Find the e.m.f. and the internal resistance of the battery.

(OR)

15. (a) Define refractive index of the medium. Show that the refractive index of (8 marks) the medium y with respect to x is equal to the reciprocal of the refractive index of x with respect to y.

An object is 30 cm from a lens and its image is formed 10 cm on the same side as the object from the lens. Find magnification and power of the lens.

(b) State Ohm's law. What must be done to increase the capacitance of the (8 marks) capacitor? What type of current is produced by a storage battery?

When an ammeter is connected in parallel with a current-carrying resistor it reads 5 A. When the ammeter and a 10 Ω resistor are joined in series and the combination is connected in parallel with the first resistor the ammeter reads 3.5 A. What is the potential difference across the first resistor?