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. Choose the correct answer from the following.   (4 marks)
   (i)   An electric bell is the use of the ---------- effect of current.
         (A. heating,   B. magnetic,   C. chemical)
   (ii) The unit of power of a lens is ----------.
         (A. dioptre,   B. joule,   C. watt)
   (iii) The force applied to an elastic body is called ----------.
         (A. pressure,   B. strain,   C. stress)
   (iv) Radioisotope iodine-123 is ---------- emitter.
         (A. alpha,   B. beta,   C. gamma)

2. Match the following.   (4 marks)

(i)	Binocular	A. measure particles and radiations
(ii)	Screwjack	B. total reflecting prisms
(iii)	Solenoid	C. simple machine
(iv)	Detector	D. cylindrical coil of wire

3. The animal has a skin temperature of 33 °C and is in a room where the walls are   (4 marks)
   at temperature 29° C. If the emissivity is 1 and the body surface area is 1.5 m^2,
   find the rate of heat loss due to radiation. ($\sigma = 5.685 \times 10^{-8}$ W m^{-2} K^{-4})

4. What are the necessary conditions for total internal reflection to take place?   (4 marks)
   Draw the ray diagram to illustrate the total internal reflection.

5. A machine with a velocity ratio of 8 requires 1000 J of work to raise a load of   (4 marks)
   250 N through a vertical distance of 2 m. Find the efficiency and mechanical
   advantage of the machine.

6. Define resistance of a conductor in words and in symbols by using Ohm's law.   (4 marks)
   Draw an electric circuit for measurement of current and voltage to demonstrate
   Ohm's law.

7. Describe how stationary wave can be produced. Illustrate the first two resonant frequencies for an open organ pipe. Where a node is formed in the resonance tube? Why? (4 marks)

8. A wire of $15\,\Omega$ is stretched to double its original length. If the resistivity and density of the wire do not change, find its resistance after stretching. (4 marks)

9. Which are used as fuel in a nuclear reactor? What are the mainly consisting of uranium isotopes in natural uranium? Also give their content in percentages. Draw a circuit diagram for biasing an npn transistor. (4 marks)

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

10. (a) Mention one of the uses of Archimedes' principle. Why is a body loss in weight when it is immersed in water? (8 marks)
The density of the lead block is 11.5 g cm^{-3} and it is floating in mercury of density 13.6 g cm^{-3}. What portion of the lead block is above the mercury? What force is needed to press the block to immerse it totally if the mass of the lead block is 4 kg? Why is the lead block floating in mercury? ($g = 10$ ms^{-2})

(b) (i) How does the total emissive power of a black body depend on the absolute temperature? If the absolute temperature of a black body is doubled, how is the total emissive power affected? (8 marks)
Why are the handles of saucepans, kettles and electric irons usually made of plastic or wooden?

(ii) Find the frequencies of the first and third harmonics of the longest string in a grand piano. The length of the string is 1.98 m and the velocity of the wave in the string is $v = 130$ m s^{-1}.

11. (a) Show that the refractive index of the medium in which an observer is situated is the ratio of the apparent depth to the real depth. (8 marks)
When a drop of ink at the bottom of a transparent slab 4 cm thick is viewed from above, it is seen at a spot 2.25 cm from the upper surface. Find the refractive index and critical angle of the slab.

(b) How far must a lens of focal length 10 cm be placed from an object to produce an image on a screen where the image is two times the size of the object? Draw a ray diagram which shows your result. (8 marks)

12. (a) Is the surface of a charged conducting sphere an equipotential surface? (8 marks)
Why? Draw the equipotential surfaces between two parallel plates having
charges of equal magnitude and opposite sign.
The electric potential difference between two parallel metal plates which
are 0.5 cm apart is 0.5×10^3 V. Find the force on an electron located
between the plates. (charge of electron = 1.6×10^{-19} C)

(b) How can you test whether an electric field exists at a certain point? When a (8 marks)
charge is given to a conducting object of any shape, how does the charge
spread out?
Two metal spheres of the same size, one with a charge of $+ 2 \times 10^{-5}$ C and
the other with a charge of -1×10^{-5} C are 10 cm apart. The two spheres are
brought into contact, and then separated again to 10 cm. What is the the
force between them? Draw a diagram which shows the direction of the
electric force agree with your result. ($K = \dfrac{1}{4\pi\varepsilon_0} = 9\times10^9$ Nm^{2}C^{-2})

13. (a) Draw a magnetic field around a solenoid. Is it identical with that of a bar (8 marks)
magnet? Can a solenoid be considered as a bar magnet?
A 150 V voltmeter has a resistance of 20 000 Ω. When it is connected in
series with a resistor across a 120 V mains line it reads 5 V. What is the
resistance of the resistor?

(b) Write down the relation between the practical unit of electrical energy and (8 marks)
the unit of work. If one kW lamp is used for one hour what would the
meter show? Why is electrical energy transformed into heat energy when a
current flows through a resistor?
Find the rate of production of heat by each resistor when the 2 Ω and 3 Ω
are connected in series to a 12V battery. Draw the circuit diagram to show
your answer.

14. (a) What is a nuclear reactor? Why is a moderator needed in a nuclear reactor? (8 marks)
Which nucleus is struck by a neutron in nuclear fission? How do you
understand by the term chain reaction?
How many junctions are there in a transistor? What are they? Explain how
a transistor can be used as a power amplifier.

(b) What is a logic gate? Draw a diagram of fire alarm using logic gates and (8 marks)
explain how it works together with its truth table.

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15. (a) Define efficiency in terms of mechanical advantage and velocity ratio. **(8 marks)** Where is the term efficiency in physics and engineering used? Does the mechanical advantage of a machine depend on the friction present?
A cube of ice of refractive index 1.31 is placed on a glass slab of refractive index 1.5. If a ray of light passing from the glass slab to the ice has an angle of incidence of 65°, will the ray enter the ice?

(b) What is the capacitance of a capacitor? Write down the sub- multiple units **(8 marks)** of farad used for practical purposes. Is there any kind of material that, when inserted between the plates of a capacitor, reduces its capacitance?
A parallel-plate capacitor of capacitance 6 μF is given the charge 12 μC and then disconnected from the circuit. How much work is required to pull apart the plates of this capacitor to twice their original separation?

(OR)

15. (a) How X-rays are produced in the laboratory? Draw a neat diagram of X-ray **(8 marks)** tube. Give the uses of soft X-rays and hard X-rays.

(b) What is the difference between the e.m.f. of a battery and the potential **(8 marks)** difference across its terminals? Under what condition are they the same?

In the given electric circuit , find the reading of the ammeter A when the switch is: (i) open (ii) closed.