Reg. No.

Code No. 1015

Name : ..

Time : 2 Hours
Cool-off time : 15 Minutes

Second Year – March 2016

Part – III

PHYSICS

Maximum : 60 Scores

General Instructions to Candidates :

- There is a 'cool-off time' of 15 minutes in addition to the writing time of 2 hrs.
- You are not allowed to write your answers nor to discuss anything with others during the 'cool-off time'.
- Use the 'cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- All questions are compulsory and only internal choice is allowed.
- When you select a question, all the sub-questions must be answered from the same question itself.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

നിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും. ഈ സമയത്ത് ചോദ്യങ്ങൾക്ക് ഉത്തരം എഴുതാനോ, മറ്റുള്ളവരുമായി ആശയവിനിമയം നടത്താനോ പാടില്ല.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം എഴുതണം.
- ഒരു ചോദ്യനമ്പർ ഉത്തരമെഴുതാൻ തെരഞ്ഞെടുത്തു കഴിഞ്ഞാൽ ഉപചോദ്യങ്ങളും അതേ ചോദ്യനമ്പരിൽ നിന്ന് തന്നെ തെരഞ്ഞെടുക്കേണ്ടതാണ്.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

1. (a) A receiver in a communication system must have

(i) pick-up antenna (ii) demodulator

(iii) amplifier (iv) all of these **(Score : 1)**

(b) Which of the following statements is wrong ?

(i) The attenuation of surface waves increases with increase in frequency.

(ii) The phenomenon involved in sky wave propagation is similar to total internal reflection.

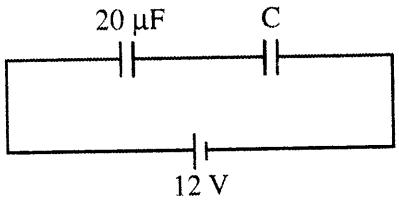
(iii) Space wave mode of propagation is used in satellite communication.

(iv) Sky wave propagation is useful only in the range of frequencies 30 to 40 MHz. **(Score : 1)**

2. An equipotential surface is a surface with constant value of potential at all points on the surface.

(a) What is the amount of work done in moving a 2 μc charge between two points at 3 cm apart on an equipotential surface ? **(Score : 1)**

(b) Two capacitors are connected as shown in figure below



If the equivalent capacitance of the combination is 4 μF

(i) Calculate the value of C.

(ii) Calculate the charge on each capacitor.

(iii) What will be the potential drop across each capacitor ? **(Scores : 3)**

(c) Two metallic spheres of same radii, one hollow and one solid, are charged to the same potential. Which will hold more charge ?

(i) Solid sphere

(ii) Both will hold same charge

(iii) Hollow sphere

(iv) Cannot predict **(Score : 1)**

3. (A) The following question has choice :

(a) Which of the following obeys Ohm's law ?

(i) Transistor (ii) Nichrome

(iii) Diode (iv) Liquid electrolyte **(Score : 1)**

(b) A wire has a resistance of 10 Ω. It is stretched by 10% of its original length, what will be the new resistance ?

(i) 10 Ω (ii) 11 Ω

(iii) 9 Ω (iv) 12.1 Ω **(Score : 1)**

(c) With the help of a circuit diagram describe the method to find the value of an unknown resistance using meter bridge arrangement. **(Scores : 4)**

OR

(B) (a) Which of the following material is used to make wire wound standard resistors ?

(i) Manganin (ii) Germanium

(iii) Copper (iv) Carbon **(Score : 1)**

(b) A bread toaster and a bulb are connected parallel in a circuit. The toaster produces more heat than the bulb. Which of the following statements is true ?

(i) Resistance of toaster is greater than resistance of bulb.

(ii) Resistance of bulb is same as the resistance of toaster.

(iii) Resistance of bulb is greater than resistance of toaster.

(iv) Cannot predict. **(Score : 1)**

(c) With the help of a circuit diagram describe the method to find the internal resistance of a cell using potentiometer. **(Scores : 4)**

4. (a) The work function of a metal is 6 eV. If two photons each having energy 4 eV strike with the metal surface

(i) will the emission be possible ?

(ii) why ? **(Scores : 2)**

(b) The waves associated with matter is called matter waves. Let λ_e and λ_p be the de –Broglie wavelengths associated with electron and proton respectively. If they are accelerated by same potential, then

(i) $\lambda_e > \lambda_p$ (ii) $\lambda_p > \lambda_e$

(iii) $\lambda_p = \lambda_e$ (iv) $\lambda_e = \frac{1}{\lambda_p}$ **(Score : 1)**

5. (a) The core of a transformer has the following properties :

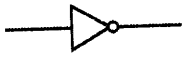
(i) core is laminated.

(ii) hysterisis loop is narrow.

Explain the significance of each property. **(Scores : 2)**

(b) What is meant by resonance in an LCR circuit ? **(Score : 1)**

6. (a) Which of the following symbol represents a universal gate ?

(i) 

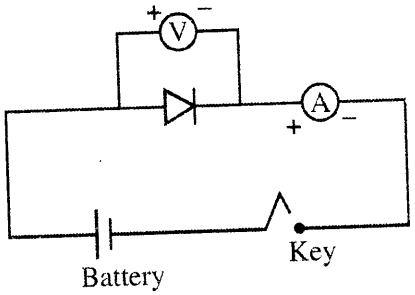
(ii) 

iii) 

(iv) 

(Score : 1)

(b) Shown below is an experimental set up with a semiconductor diode



(i) identify the experiment

(ii) draw the resulting graph

(Scores : 2)

(c) With the help of neat circuit diagram obtain an expression for voltage gain of a transistor amplifier in C-E configuration. **(Scores : 3)**

7. A moving charge can produce a magnetic field.

(a) How does a current loop behaves like a magnetic dipole ? **(Score : 1)**

(b) Draw the magnetic field lines for a current loop to support your answer. **(Scores : 2)**

(c) (i) What is a cyclotron ?

(ii) Write down the expression for cyclotron frequency. **(Scores : 2)**

8. (a) List out any two limitations of Bohr atom model. **(Scores : 2)**

(b) According to de-Broglie's explanation of Bohr's second postulate of quantization, the standing particle wave on a circular orbit for n = 4 is given by

(i) $2\pi r_n = 4/\lambda$ (ii) $\frac{2\pi}{\lambda} = 4r_n$

(iii) $2\pi r_n = 4\lambda$ (iv) $\frac{\lambda}{2\pi} = 4r_n$ **(Score : 1)**

9. (a) What do you mean by Q value of a nuclear reaction ? **(Score : 1)**

(b) Write down the expression for Q value in the case of $\propto$ decay. **(Score : 1)**

(c) Two nuclei have mass numbers in the ratio 1 : 64. What is the ratio of their nuclear radii ? **(Scores : 2)**

10. (a) How much greater is one micro coulomb compared to an electronic charge ?

(i) 10^{13} times (ii) 10^{10} times

(iii) 10^{11} times (iv) 10^{6} times **(Score : 1)**

(b) A point charge of 2 μc is placed at the centre of a cubic Gaussian surface of side 0.5 cm. What is the net flux through the surface ?

(Given $\varepsilon_0 = 8.85 \times 10^{-12} C^2/N/m^2$.) **(Scores : 2)**

11. (a) State Gauss' law for magnetism. **(Score : 1)**

(b) How this differs from Gauss' law for electrostatics ? **(Score : 1)**

(c) Why is the difference in the two cases ? **(Score : 1)**

12. Match the following :

(i)	X-rays	Water purifier
(ii)	Infrared	Cancer treatment
(iii)	Microwave	Remote switch
(iv)	Ultraviolet	Radar

(Scores : 2)

13. (a) The electrical analog of mass is

(i) diode (ii) capacitance

(iii) inductance (iv) resistance **(Score : 1)**

(b) A 2 m long solenoid having diameter 6 cm and 2000 turns has a secondary of 500 turns wound closely near its mid-point. Calculate the mutual inductance between the two coils. **(Scores : 2)**

14. (A) The following questions has choice :

(a) Unpolarized light is incident on a plane glass surface. What should be the angle of incidence so that the reflected and refracted rays are perpendicular to each other ? (Given n = 1.5) **(Scores : 2)**

(b) Using Huygen's concept of wave front, derive Snell's law of refraction. **(Scores : 3)**

OR

(B) (a) Light waves from two coherent sources having intensities I and 2I cross each other at a point with a phase difference of 60°. What is the resultant intensity at the point ? **(Scores : 2)**

(b) With the help of a diagram obtain an expression for finding the distance between two consecutive bright or dark fringes in the interference pattern produced by double slits. **(Scores : 3)**

15. (A) The following is a choice question :

(a) If the focal length of a double convex lens is 12 cm and radii of curvatures of faces are 10 cm and 15 cm respectively, what is the refractive index of the lens ? **(Scores : 2)**

(b) (i) Draw the ray diagram showing the formation of image by a compound microscope. **(Scores : 2)**

(ii) Show that in order to achieve large magnification in a compound microscope the magnitude of focal length of objective and eye piece should be small. **(Scores : 3)**

OR

(B) (a) What is the structure of an optical fibre ? **(Scores : 2)**

(b) What is the principle used for transmitting audio and video signals using optical fibre ? Explain the principle. **(Scores : 2)**

(c) With the help of a neat diagram arrive at an expression for finding the refractive index of a prism. **(Scores : 3)**