

# COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Government of Maharashtra.)  
SHIVAJI NAGAR, PUNE - 411 005

## END Semester Examination

### Basic Physics

Course: F. Y. B.Tech.

Branch: Planning

Semester: Sem I

Year: 2014-2015

Max.Marks:60

Duration: 3 Hours Time:- 10am - 1 pm

Date:25/11/2014

#### Instructions:

MIS No.

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1. Figures to the right indicate the full marks.
2. Mobile phones and programmable calculators are strictly prohibited.
3. Writing anything on question paper is not allowed.
4. Exchange/Sharing of anything like stationery, calculator is not allowed.
5. Assume suitable data if necessary.
6. Write your MIS Number on Question Paper

Q.1 Explain any five of the following concepts. (2 MARKS EACH)

- A) Coherent waves
- B) Force Field
- C) Interference of Waves
- D) Electrostatic potential
- E) Dual nature of light
- F) Thermodynamic work done

Q.2 Answer the following questions any five (4MARKS EACH)

- A) If  $y_1 = A \cos(kx - \omega t)$  and  $y_2 = A \cos(kx - \omega t + \phi)$  use superposition principle to find resultant of  $y_1$  and  $y_2$  and sketch it for  $\phi = 0$  &  $\phi = \pi$
- B) Using Biot-Savart's law in magnetostatics find the magnetic field at a distance  $s$  from a long straight wire carrying a steady current  $I$  and using the same prove that;  $\int \vec{B} \cdot d\vec{l} = \mu_0 I_{enc}$  where  $\mu_0$  is the permeability of the medium.
- C) State four laws of Thermodynamics in correct scientific words.
- D) Explain reversible and irreversible processes with suitable examples.
- E) Write the conditions for an acceptable wavefunction  $\psi$  (any four).
- F) Using Heisenbergs uncertainty principle( position and momentum uncertainty) show that electron can not have existence inside

the nucleus. ( Take average nucleus radius  $r_n = 1 \times 10^{-14} \text{m}$  )

Q.3 Write the answers for the following any TEN. ( 3 Marks each)

- Suppose the electric field in some region is found to be  $E = kr^3 \hat{r}$  in spherical polar coordinates ('k' is some constant), find the charge density 'ρ'.
- Starting from Ampere's law in magnetostatics for a given volume current distribution system in a medium having permittivity ' $\mu_0$ ', show that  $\nabla \times B = \mu_0 J$
- Calculate two long parallel wires which are kept at a distance apart. The two wires are carrying current I And 2I in the same direction. What is the magnetic field at a point which is midway between two wires draw a diagram showing the direction of the field with respect to the direction of the current.
- A steady current I flows down a long cylindrical wire of radius a. (fig 2) Find the magnetic field both inside and outside of cylinder if current is uniformly distributed.
- In fig.1 inner cylinder is charged with uniform line charge density  $\lambda$ . find the electric field between two cylinders and from that find the potential difference between the cylinders.
- Find the potential at a distance s from a straight infinitely long wire that carries uniform charge density  $\lambda$ . Compute the gradient of your potential ( $\nabla V$ ) and show that it yields the same field E.
- Describe with suitable diagram Young's double slit experiments and obtain conditions of constructive and destructive interference pattern.
- Prove that gravitational force between two objects with masses  $m_1$  and  $m_2$  and with distance of separation 'r' is central in nature.
- An electron and 150 gm baseball are travelling at 220 cm/s measured to an accuracy of .065%. Calculate and compare uncertainty in position of each bodies
- Find De-broglie wavelength of an electron accelerated through potential difference of 180 volts.
- Write a short note on "Heisenbergs uncertainty principle" for position and momentum of a particle under the motion of any force field.
- State any three properties of De-Broglie wave

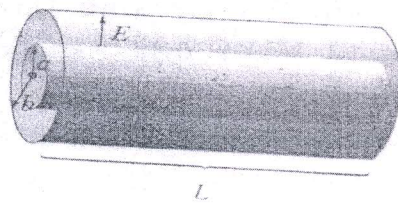


Fig 1

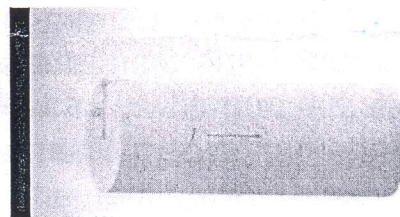


Fig.2