

Roll No. _____

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SIIS-N 188 B-16
B.Sc. IIIrd Semester Degree Examination
Physics
(Mathematical, Electromagnetic, Energy & Biophysics)
Paper : III
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates :

- 1) Answer **all** questions from section 'A'
- 2) Answer any **FIVE** questions from section 'B' & any **FOUR** questions from section 'C'

SECTION - A

I. Answer All the following questions (15×1=15)

- 1) Give the value of $\vec{P} \times \vec{Q}$ for two vectors \vec{P} & \vec{Q} inclined at an angle ϕ
- 2) Give the value of $\text{Div}(\text{Curl } \vec{E})$
- 3) Define the term gradient of a scalar field
- 4) What is an even function?
- 5) Give the characteristic feature of steady current
- 6) What is the velocity of EM wave in vacuum?
- 7) Can a charge moving with uniform velocity produce electromagnetic waves?
- 8) Is an electromagnetic wave transverse?
- 9) What is Skin effect?
- 10) Give an example of non-conventional energy resource
- 11) What is nuclear fusion?
- 12) How nuclear fission chain reaction is controlled in a reactor?
- 13) What is "Plasma"?
- 14) Which is the most abundant molecule found in a biological cell?
- 15) What is facilitated diffusion?

SECTION - B

II Answer any Five questions. (5×5=25)

- 16) If $\vec{E} = x^2z\vec{i} - 4x^2y^2\vec{j} + xy^2z\vec{k}$, then find $\nabla \cdot \vec{E}$ at the point (1,-1,1)
- 17) Show that $(\vec{A} \times \vec{B}) \times \vec{C} + (\vec{B} \times \vec{C}) \times \vec{A} + (\vec{C} \times \vec{A}) \times \vec{B} = 0$
- 18) What is poynting vector? Give it's physical significance
- 19) State and explain Faraday's laws of electromagnetic induction
- 20) Obtain an expression for torque on dipole
- 21) Describe C-N Cycle and P-P cycle of nuclear fusion
- 22) Explain the mechanism of fluid flow in plants.

SECTION - C

III Answer any four questions (10×4=40)

- 23) a) Evaluate Fourier Coefficients for even function (5+5)
b) Express saw tooth wave in the form of Fourier series
- 24) a) Deduce Ampere's law in the form $\oint \vec{B} \cdot d\vec{\ell} = \mu_0 I$ where symbols have the usual meaning. (5+5)
b) A radio station radiates power of 10^5 W uniformly over a hemisphere concentric with the station. Find magnitude of poynting vector and amplitude of electric & magnetic field at a point 10 Km from the radio station. $\epsilon_0 = 9 \times 10^{-12}$ Farad / meter and $\mu_0 = 4\pi \times 10^{-7}$ Henry / meter
- 25) Deduce an expression for propagation of plane electromagnetic wave in free space. Show that electric and magnetic vectors are perpendicular to each other and to the direction of propagation (10)
- 26) What is a 'Nuclear Reactor' ? Describe various types of nuclear reactors (10)
- 27) What are the major drawbacks of conventional energy resources? Explain (10)
- 28) Describe the various methods (Types) of passive transport across a biological cell membrane. (10)