V.P. & R.P.T.P. Science College

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B.Sc. (Semester - 2) Subject: Physics Course: US02CPHY21

INTERNAL TEST

Date. 8-03-2019, Friday   Time: 12.30 pm to 02.30 pm

Total Marks: 50

Q-1 MCQs: **[8 Marks]**

1. For a solenoidal vector $\vec{V}$,

    (a) $\vec{\nabla} \cdot \vec{V} = 0$ (b) $\vec{\nabla} \times \vec{V} = 0$ (c) $\vec{\nabla} |\vec{V}| = 0$ (d) $\vec{\nabla} \cdot \vec{V} \neq 0$

2. $\vec{A} \cdot (\vec{B} \times \vec{C}) = $ _____.

    (a) $\vec{A} \cdot (\vec{C} \times \vec{B})$ (b) $\vec{B} \cdot (\vec{A} \times \vec{C})$ (c) $\vec{B} \cdot (\vec{C} \times \vec{A})$ (d) $\vec{C} \cdot (\vec{B} \times \vec{A})$

3. Theory of relativity is valid only when _____.

    (a) object is moving with large velocity
    (b) observer is moving with large velocity
    (c) both (a) & (b) are true
    (d) both (a) & (b) are false

4. Mass of an object will be double of its value of rest if speed of the object is ____ $\times 10^8$ m/s.

    (a) 0.6   (b) 1.6   (c) 2.6   (d) 3.6

5. Which rectifier uses only one diode?

    (a) half-wave (b) full-wave   (c) bridge   (d) centre-tap

6. Which part of a transistor is largest in size?

    (a) base (b) collector (c) emitter (d) battery

7. Which of these pumping method is used in Ruby laser?

    (a) Optical pumping   (b) Electrical discharge
    (c) Chemical reaction   (d) In-elastic atom-atom collision

8. Which of these is not one of the laser properties?

    (a) high coherence   (b) high directionality
    (c) high chromacity   (d) high intensity

Q-2 Short Questions [Attempt any FIVE]   **[5 ×2 Marks = 10 marks]**

1. State the theorem which gives the relation between line integral and surface integral.
2. Prove that position vector $\vec{r}$ is an irrotational vector.
3. Write any two differences between inertial and non inertial frame of reference.
4. Discuss the outcomes of Michelson-Morley experiment.
5. What is a rectifier? Why we need it?
6. What are power diodes? State their characteristics and applications.
7. Write full name of LASER. State various properties of a laser.
8. Explain stimulated absorption.

Q-3   Define vector product of three vectors.   **[8]**
Show that, $\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}\,(\vec{A} \cdot \vec{C}) - \vec{C}\,(\vec{A} \cdot \vec{B})$.

OR

Q-3   Explain the physical significance of gradient of a scalar point **[8]** function. If $\vec{r}$ is position vector, show that

(i) $\vec{\nabla} \left(\frac{1}{r} \right) = -\vec{r} / r^3$ and (ii) $\vec{\nabla} (r^2) = 2\,\frac{\hat{r}}{r}$.

Q-4   State Einstein's Postulates of Special Relativity. Write (i) Lorentz **[8]** transformation equations (ii) Inverse Lorentz transformation equations. Write note on equivalence of mass and energy.

OR

Q-4   Show that the mass of the body in motion is given by **[8]**
$m = \dfrac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$, where m_0 is the rest mass and v is the velocity of the body.

Q-5   Explain construction and working of a half-wave rectifier. **[8]** Discuss its PIV. Obtain expression for its output dc voltage.

OR

Q-5   Draw the circuit to determine static characteristics of NPN **[8]** transistor in CE mode. Explain input and output characteristics.

Q-6   Write a note on Nd:YAG laser.   **[8]**

OR

Q-6   Write a note on CO_2 laser.   **[8]**

==**ALL THE BEST**