

**B.TECH. COMPUTER SCIENCE & ENGINEERING  
FIRST SEMESTER  
ENGINEERING PHYSICS  
BCS-104**

**SET  
A**

[USE OMR SHEET FOR OBJECTIVE PART]

Duration: 2hr. 30 mins.

Full Marks: 60

Time: 15 mins.

**(Objective)**

Marks: 10

Choose the correct answer from the following:

1X10=10

- When a charged particle is projected into a uniform magnetic field then it experiences a maximum force equal to:  
a.  $qvB (\sin \theta)$   
b.  $qvB (\cos \theta)$   
c.  $qvB$   
d. Zero
- The unit of permittivity:  
a.  $[\epsilon_0] = M^{-1}L^{-3}T^2I^1$   
b.  $[\epsilon_0] = M^{-1}L^{-3}T^4I^2$   
c.  $[\mu_0] = M^1L^1T^{-2}I^{-2}$   
d.  $[\mu_0] = M^1L^2T^{-1}I^1$
- The fringes width in Young's double slit experiment can be increased if we decrease:  
a. Separation of slits  
b. Width of slits  
c. Wavelength of light used  
d. Distance between slits and screen
- In Stimulated Absorption, what is the lifetime of atoms ground state?  
a. 1 second  
b. 1 minute  
c. 1 hour  
d. Infinity
- SI unit of stress is:  
a. Newton  
b. Pascal  
c. Ampere  
d. Joule
- Ideally a rigid body is:  
a. Rigid body is a solid body  
b. It does not deform its shape after applying force  
c. Both a & b  
d. None of the above
- Which of the following is a correct relation according to Heisenberg's Uncertainty principle?  
a.  $\Delta x \cdot \Delta p \leq h/4\pi$   
b.  $\Delta x \cdot \Delta v \leq h/4\pi$   
c.  $\Delta x \cdot \Delta p \geq h/4\pi$   
d.  $\Delta x \cdot \Delta v \geq h/4\pi$
- The advantage of LED is:  
a. Long life  
b. Fast on-off switching  
c. Low operating voltage  
d. All of the above

9. Static friction is less than:
- a. Sliding friction
  - b. Rolling friction
  - c. Both a and b
  - d. None of these
10. SI unit of angular momentum:
- a.  $\text{Kg m}^3/\text{s}$
  - b.  $\text{Kg}/\text{m}^3$
  - c.  $\text{Kg m}^2/\text{s}^2$
  - d.  $\text{Kg m}/\text{s}$
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**( Descriptive )**

Time : 2 hr. 15 mins.

Marks : 50

[ Answer any five questions from the following ]

1. a) Prove the 3<sup>rd</sup> and 4<sup>th</sup> Maxwell's law of electromagnetism. 3+3=6  
b) State and Derive Gauss's law from the electric field equation. 4
2. a) Calculate the divergence and curl of a field, if 5  
 $\vec{A} = 4kx^3y^3\hat{j} + 3iy^3z^3\hat{i} + 12jz^3x^3\hat{k}$ .  
b) Derive the electric field due to the dipole on the axial line and the magnetic field due to the magnetic moment on the axial line. 5
3. Derive the expression of force in spherical coordinates. 10
4. a) Derive the centripetal and Coriolis acceleration of a particle from the polar coordinate. 7  
b) Calculate the kinetic friction, if 5 N force acting on a body of mass 40kg for which its acceleration is  $2.5 \text{ m/s}^2$ . 3
5. a) Explain Euler's law with its formula. What is meant by rigid body motion in terms of angular velocity and moment of inertia? 2+3=5  
b) Generate the equation of the formation of the standing wave in a string. The equation of transverse simple harmonic progressive wave is  $y = 3 \sin 2\pi (t/0.04 - x/40)$ , where the length is expressed in cm and the time in seconds. Calculate the wavelength, frequency, amplitude and the speed of the wave. 2+3=5
6. a) The diameter of the 13th ring and the 3rd ring in Newton's rings experiment were found to be  $55.2 \times 10^{-4} \text{ m}$  and  $27.5 \times 10^{-4} \text{ m}$  respectively. If a sodium lamp ( $\lambda=589\text{nm}$ ) is used as a source, calculate the radius of the planoconvex lens. 4  
b) Write the properties of a laser beam. Derive the expression for Einstein's coefficient of a laser beam. 2+4=6
7. Draw a circuit diagram for a common emitter NPN transistor with an input characteristics curve. Write a working theory of half-wave rectifiers with a proper diagram. What is a P-N Junction diode? How the depletion layer is formed? Explain with a diagram. 3+3+1+3=10
8. a) Derive the path difference in the Young's double slit experiment with its proper diagram. In Young's experiment, the distance between the two slits is 0.8 mm and the distance of the screen from the slits is 1.2m. If the fringe width is 0.75 mm, calculate the wavelength of light. 4+2=6  
b) Explain the stress-strain curve. 4

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