Total No. of Questions – [10] Total No. of Printed Pages: 2

G.R. No.	

Paper code - U118-104NCB (CBE-FS)

MAY 2019 / BACKLOG

F. Y. B.TECH. (COMMON) (SEMESTER - I)

COURSE NAME: Engineering Physics (NCB)

COURSE CODE: ES10184A-NCB

(PATTERN 2018)

Time: [2 Hours] [Max. Marks: 50]

Instructions to candidates:

1) **Attempt Q.1, Q.2, Q.3, Q.4 OR Q.5, Q.6 OR Q.7,Q.8 OR Q.9 and Q.10**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed.**
4) **Use suitable data where ever required.**

Q1(a) Derive an expression for displacement in a free undamped oscillation. **[4]**

OR

Q1(b) A spring-mass system has a natural period of 0.87 sec. What will be the new period if the spring constant is increased by 75 percent? **[4]**

Q2(a) Discuss briefly (a) echo, (b) focusing and defocusing, (c) echelon effect and (d) reverberation arising due reflection of sound in an auditorium. **[4]**

OR

Q2(b) Bulk modulus and Shear modulus for mild steel are B = 16.3×10^{10} N/m^2 and S = 7.8×10^{10} N/m^2, respectively. If the density is ρ = 7860kg/m^3, calculate the velocity v_p of primary sound wave. **[4]**

Q3(a) With the help of a neat diagram derive Bragg's law. Explain how Bragg's law is used in a X-ray diffractometer by drawing a schematic diagram of θ - 2θ configuration. **[6]**

OR

Q3(b) Draw ray diagram for a optical compound microscope and derive its magnification. Also define resolving power and depth of focus. **[6]**

Q4(a) If $Z = 1 - lnA$, derive the formula for ΔZ. If $A \pm \Delta A = 129 \pm 1$, calculate $Z \pm \Delta Z$. **[6]**

Q4(b) Explain with the help of neat diagrams, construction and working of a photo-conductor detector. **[4]**

OR

Q5(a) With the help of neat diagrams, discuss cases of (a) high accuracy (b) low accuracy (c) high precision and (d) low precision in measurement of physical quantities. **[6]**

Q5(b) A car travels a distance of 54 ± 1 m in 2.3 ± 0.1 seconds. Calculate the average velocity and error in velocity and write it as v ± Δv. **[4]**

Q6(a) Draw the circuit diagram for a strain gauge with a gauge factor GF **[6]**

configured in a quarter Wheatstone bridge. It is excited by a excitation voltage V_{ex}. If the strain gauge is subjected to a strain of ε, then obtain an expression for its output voltage V_o.

Q6(b) Describe with the help of block diagrams and examples, the difference between a direct and a complex sensor. **[4]**

OR

Q7(a) Describe with the help of diagrams, use of differential capacitor method for measurement of displacement and hence derive an expression for output voltage V_{out}. **[6]**

Q7(b) Calculate the gauge factor for a Nichrome strain gauge with Poisson ratio of 0.29 and piezo-resistivity $\frac{\Delta\rho}{\rho} = 5.2 \times 10^{-6}$ for a strain of $\varepsilon_l = 10^{-5}$. **[4]**

Q8(a) Explain with the help of neat diagrams principle, construction and working of a CO_2 laser. **[6]**

Q8(b) 1kW laser of CO_2 laser (λ=10.6μm) comes out of an aperture with diameter of 10mm. Calculate the intensity of the beam at a distance of 10m from the output aperture. **[4]**

OR

Q9(a) Explain with the help of neat diagrams principle, construction and working of a Nd:YAG laser. **[6]**

Q9(b) A laser with wavelength of 7500Å has a spectral width $\Delta\lambda = 0.5$Å. It comes out of an aperture with a diameter of 4mm. Calculate coherence length and Rayleigh range. **[4]**

Q10(a) If $Z = A/B$ then $\left(\frac{\Delta Z}{Z}\right)^2$ is **[1]**

(i) $\frac{\Delta A}{A} + \frac{\Delta B}{B}$ (ii) $\frac{\Delta A}{A} - \frac{\Delta B}{B}$

(iii) $\left(\frac{\Delta A}{A}\right)^2 + \left(\frac{\Delta B}{B}\right)^2$ (iv) $\left(\frac{\Delta A}{A}\right)^2 - \left(\frac{\Delta B}{B}\right)^2$

Q10(b) Which of the following errors can be corrected for by calibration of instrument **[1]**

(i) random error (ii) human error
(iii) systematic error (iv) all of the above

Q10(c) In the simultaneous presence of Pink noise and Johnson noise the total noise is given by **[1]**

(i) $V_{noise}^2 = V_j^2 - V_{pink}^2$ (ii) $V_{noise}^2 = V_j^2 + V_{pink}^2$
(iii) $V_{noise}^2 = V_j^2 / V_{pink}^2$ (iv) $V_{noise}^2 = V_j^2 \times V_{pink}^2$

Q10(d) Laser had high Rayleigh range if it is highly **[1]**

(i) monochromatic (ii) intense
(iii) directional (iv) efficient

Q10(e) Nd:YAG laser is a _____ laser **[1]**

(i) gas (ii) semiconductor
(iii) liquid state (iv) solid state

Q10(f) Life time of the ground state is **[1]**

(i) nanosecond (ii) millisecond
(iii) infinity (iv) zero