G.R. No.	

Paper Code —V113-2044A (BE) NCB

DECEMBER 2023 / BACKLOG

F. Y. B. TECH. (COMMON)

COURSE NAME: Engineering Physics (NCB)

COURSE CODE: ES10184A-NCB

(PATTERN 2018)

Time: [2hrs]   [Max. Marks: 60]

Instructions to candidates:
1) Figures to the right indicate full marks.
2) Use of scientific calculator is allowed
3) Use suitable data wherever required
4) Mass of electron $m_e = 9.1 \times 10^{-31} kg, e = 1.6 \times 10^{-19}C, h = 6.63 \times 10^{-34}Js$,
   $k = 8.6 \times 10^{-5} eV/K, c = 3 \times 10^8 m/s$

Q.No.	Questions	Max. Marks	CO mapped	BT Level
Q1.	**Choose the correct option**	[30]		
	A) For a viscously damped free oscillation, the amplitude varies as a) $e^{-\zeta \omega_D t}$ b) $e^{-\zeta \omega_n t}$ c) $e^{-\zeta \omega_n}$ d) $e^{-\zeta t}$	[2]	1	U
	B) In an undamped free oscillation, the angular frequency is a) $\omega_D = \omega_n \sqrt{1-\zeta^2}$ b) $\omega_n = \sqrt{\frac{k}{m}}$ c) $\omega_D < \omega_n$ d) $\omega_D > \omega_n$	[2]	1	R
	C) Calculate the logarithmic decrement for a damped oscillator with a damping ratio of 0.13 a) 0.81 b) 8.1 c) 1.8 d) 0.081	[2]	1	A
	D) For a damped spring mass system with mass m=1.5 Kg, k=49N/m, u(0)=-0.215, $u(0) = 15cm/s, \omega_n$ is a) 2.57 rad/s b) 7.52 rad/c c) 5.72 rad/s d) none of these	[2]	1	A
	E) If the displacement of a simple harmonic motion is represented by the equation $u(t) = (1.65$ cm$)$ sin(7t-0.01), what is the amplitude?	[2]	1	U

	a) 7cm b) 0.01 cm c) none of these d)1.65 cm			
	F) For ultrasound, _____ is higher than that for audible sound a) wavelength b) frequency c) amplitude d) time period	[2]	2	R
	G) Reverberation time in an auditorium can be decreased by a) increasing volume of the auditorium b) decreasing surface area of the auditorium c) increasing hard material with small absorption of sound in the auditorium d) increasing soft material with large absorption of sound in the auditorium	[2]	2	A
	H) If the background sound level in a room is 50dB and a speaker produces an intensity level of 80dB, then the total intensity level is a) 80.004 dB b) 130 dB c) 50.8 dB d) 85 dB	[2]	2	A
	I) If the volume of a hall is increased, the reverberation time a) decreases b) increases c) first decreases then increases d) remains unchanged	[2]	2	U
	J) Given the bulk modulus $B = 0.0000161 \times 10^{10}\ N/m^2$ and *density of air* $= 1.39\ kg/m^3$, the velocity of sound in air is calculated as a) 250m/s b) 300 m/s c) 330 m/s d) 375 m/s	[2]	2	A
	K) If $\vec{a}, \vec{b}, \vec{c}$ represent the sides of a parallelepiped unit cell, its volume is given by a) $\vec{b}.\vec{a} \times \vec{c}$ b) $\vec{c}.\vec{b} \times a$ c) $\vec{a}.\vec{b} \times \vec{c}$ d) $\vec{b} \times \vec{a} \times \vec{c}$	[2]	3	R
	L) An electron accelerated by a voltage 1kV has a velocity a) $1.875 \times 10^7 m/s$ b) $2.875 \times 10^7 m/s$ c) $8.175 \times 10^7 m/s$ d) $0.875 \times 10^7 m/s$	[2]	3	A
	M) The peak intensities in an X-ray powder diffraction pattern is determined by a) elements present in the crystal b) size and shape of the unit cell c) deviation of a crystal from a perfect crystal d) nano nature of the sample	[2]	3	U
	N) The resolving power of a microscope having an objective of 100x and NA-0.9 is a) 3.1 μm b) 0.31 μm c) 1.03 μm d) 1.31μm	[2]	3	A
	O) Two objects are said to be just resolved if a) The principal maximum in the diffraction pattern of one falls over the first minimum of the second image and vice versa b)	[2]	3	U
Q.2	Answer any two	[10]		
	a) Discuss any two types of intrinsic noise associated with a resistor.	[5]	4	U

	b) If $Z = 1 - \frac{1}{A}$, then calculate $Z \pm \Delta Z$. Given $A \pm \Delta A = 50 \pm 2$.		[5]	4	A
	c) Find the values of the slope and intercept of a straight line for the following data using the method of least squares. 	x	0	2	4	6	8	 	y	1640	1298	946	588	261			[5]	4	A
Q.3	Answer any two		[10]		
	a). With the help of a neat diagram, describe the working of a pressure sensor based on differential capacitor method.		[5]	5	U
	b) Discuss in brief any three characteristics of a sensor.		[5]	5	U
	c) If the resistance of a Pt resistor is $R_0 = 100\Omega$ at 0°C, what is its resistance at 200°C? Given $A = 3.9083\times10^{-3}$ /°C and $B = -5.775\times10^{-7}$ /°C^2. a) 176 Ω b) 671 Ω c) 167 Ω d) 716 Ω		[5]	5	A
Q.4	Answer any two		[10]		
	a) Explain with a neatly labeled diagram the action of an optical cavity.		[5]	6	U
	b) Explain with the help of a neatly labeled diagram the principle, construction and working of Nd:YAG laser.		[5]	6	U
	c) If the diameter of a laser beam at the focal point of a lens is $2\lambda^2$, then calculate the intensity of a 1kW CO_2 light at the focus. Given $\lambda = 9.6\mu m$.		[5]	6	A