Paper Code – U117 -105A (T1)

Total No. of Questions – [4] Total No. of Printed Pages: 2

G.R. No.	

SEPTEMBER 2017 / IN - SEM (T1)

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

COURSE NAME: Engineering Physics

(2017 PATTERN)

Time: [1 Hour] [Max. Marks: 30]

(*) Instructions to candidates:

1) **Answer Q.1 OR Q.2, Q.3 OR Q.4**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data wherever required**

Q.1 (a) What is piezo-electric effect? Describe with the help of a diagram an oscillator which produces ultrasonic waves using inverse piezo-electric effect. What are the formulae for the frequency of the oscillator and mechanical frequency of piezo-electric crystal? What is the relationship between these two frequencies? [6]

Q.1 (b) With the help of a diagram, define intensity and intensity level of sound at a distance *r* from a point source with power P. [4]

Q.1 (c) An auditorium of volume 5500 m^3 is found to have reverberation time of 2.5 s. The sound absorbing surface of the auditorium has an area of 750 m^2. Calculate the average absorption coefficient of the auditorium. [4]

OR

Q.2 (a) Enumerate the possible sources of noise and discuss the remedies to reduce them in an auditorium. [6]

Q.2 (b) With the help of a diagram, define laws of reflection and refraction for sound. What is echo? [4]

Q.2 (c) Calculate the thickness of a quartz plate required to produce ultrasonic waves of frequency 2 MHz. Given: For quartz, Density = 2650 kg/m^3, Bulk modulus B = 3.8 $\times 10^{10}$ N/m^2 and Shear modulus S = 4.4 $\times 10^{10}$ N/m^2. [4]

Q.3 (a) With the help of a neat diagram, derive an expression for fringe width for interference due to reflection from a thin wedge shaped film when illuminated by an extended source of monochromatic light. [6]

Q.3 (b) Draw a ray diagram for Fraunhofer diffraction from a diffraction grating and define β. Assuming, $E_\theta = E_m\left(\frac{\sin\alpha}{\alpha}\right)\left(\frac{\sin N\beta}{\sin\beta}\right)$, derive the conditions for principal maxima and minima and intensity for principal maxima. [6]

Q.3 (c) Si_3N_4 with refractive index μ = 2.0458 is used as anti-reflection coating (ARC) on Si solar cell. The refractive index of Si is 3.45. Calculate the thickness of Si_3N_4 film as ARC. Assume, λ= 5500 Å. [4]

OR

Q.4 (a) Derive the conditions and expressions for intensity of light for principal maximum and minima in Fraunhofer diffraction from a single slit using a phasor diagram. [6]

Q.4 (b) Derive the conditions for constructive and destructive interference for reflection from a thin uniform film with thickness t and refractive index μ surrounded by two media with refractive indices μ_1 and μ_2, respectively. Light is incident through medium with refractive index μ_1. Given $\mu_1 < \mu < \mu_2$. [6]

Q.4 (c) A diffraction grating which having 6000 lines/cm is used at normal incidence. Calculate the dispersive power of the grating in the third order spectrum of wavelength region 5500 Å. [4]