**NUMERICALS OF UNIT 1 & 2**

1.Calculate the length of Ni rod needed to produce ultrasonic waves of frequency 40KHz. Density of rod is 8.9 gm/cm3 and Young’s modulus of rod is 20.8X 1010 N/m2.

 

 i.e. 

  =

0.0604 m

2..Calculate the fundamental frequency of quartz crystal 1nm thick. Given: density of quartz is 2650 kg/m3 and Young’s modulus is 8X1010 N/m2.





 MHz

3.Calculate the natural frequency of the ultrasonic waves generated by a quartz crystal having thickness of 5.5 mm.( Given Y= 8 ×1010 N/m2,ρ( density )=2650 Kg/m3)

Given

2650kg/m3

Y=8X 108N/m2

t=5.5 mm

  **1 Mark**

  **1 Mark**

 **1 Mark**

ɳ =499.49 KHz

4)Calculate the fundamental frequency of quartz crystalof 1mm thick having density 2650kg/m3.Given Y=8X 108N/m2

Given  2650kg/m3

Y=8X 108N/m2



 

 =

2.7472 Hz

5) Calculate the natural frequency of 40 mm length of a pure iron rod. Given the density of pure iron is 7.25 ×103 kg/m3 and its Young,s modulus is 115×109 N/m2.

Given

L=40 mm=40 X 10-3m

Ρ( Density)=7.25 ×103 kg/m3

Y=115×109 N/m2



 i.e.

  = 49784.0162Hz=49.784 KHz

**n=49.784 KHz**

 **3 Marks**

6)Newton’s rings are observed in the reflected light of wavelength 5900A0. The diameter of 10 th dark ring is 0.5 cm. Find the radius of curvature of the lens used.

Given Data

λ=5900 A0=5900X10-8cm

n=10

Dn=0.5 cm

 Dn=4Rn λ

 

 = 

**R =105.93 cm**

7) A wedge shaped film is illuminated by light of wavelength 4650 A0. The angle of wedge is 400. Calculate the fringe separation between two consecutive fringes.

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**** = 58.125

8)Refractive index of core is 1.48 and that of cladding is 1.47 in an optical fibre. Calculate critical angle , numerical aperture and acceptance angle.





 =0.1717













9) Calculate the numerical aperture of an optical fibre whose core and cladding are made of materials of reflective indices 1.6 and 1.5 respectively.

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** =**

0.5567

10) Calculate the numerical aperture of an optical fibre whose core and cladding are made of materials with refractive index 1.6 and 1.5 respectively.

Given

n1=1.6 n2=1.5

**N.A.= =**

**0.5567**