

5. a) State and explain Huygen's wave theory. Derive the thin lens formula using this theory. [3+3]  
b) Derive the expression for fringe width in Young's double slit experiment. [3]
6. a) What is quarter wave plate? Deduce its thickness for a given wavelength in terms of its refractive index [6]  
b) Calculate the thickness of a quarter wave plate for wavelength  $5890 \text{ \AA}$  and  $\mu_o = 1.5818$ ,  $\mu_e = 1.5508$ . [3]
7. a) Describe with neat diagrams the construction of a Nicol prism. Explain its working as a polarizer and as an analyzer. [6]  
b) If the plane of vibration of the incident beam makes an angle of  $30^\circ$  with the optic axis, compare the intensities of extraordinary and ordinary light. [3]
8. Write short notes on (any **Three**):- [3x3]  
a) Rainbows  
b) Diffraction  
c) Michelson interferometer  
d) Brewster's law  
e) Malus law