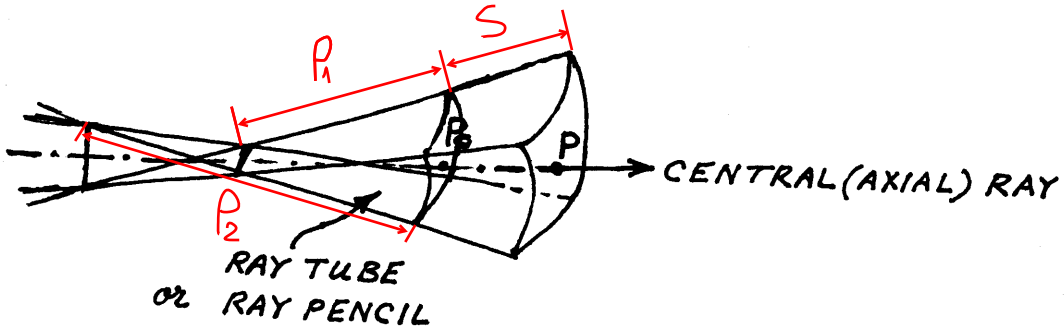
EXAM

1.



$$\bar{E}(P) \sim \bar{E}(P_o) \sqrt{\frac{\rho_1 \rho_2}{(\rho_1+S)(\rho_2+S)}}\, e^{-jkS}$$

The above expression represents the general astigmatic ray optical field $\bar{E}(P)$ at P in terms of its value at some earlier point P_o (reference point) on the axial ray

➡ On the above figure, mark the ray distance S and the caustic (or focal) distances ρ_1 and ρ_2. It does not matter which you show as ρ_1 or ρ_2.

2. The caustic distances ρ_1 and ρ_2 are the principal radii of curvature of the reference wavefront curvature at P_o in the figure shown above:

☒ TRUE ☐ FALSE.

3. The distances (ρ_1+S) and (ρ_2+S) are the principal radii of curvature of the wavefront at P in the above figure:

☒ TRUE ☐ FALSE

4. If $\rho_1 = \rho_2$ in the above figure, then the ray field in the above expression represents:

(a) ☐ plane wave ; (b) ☒ spherical wave ; (c) ☐ conical wave.

5. The phenomena of high frequency diffraction by an edge is described by:

- [x] a saddle point in the asymptotic evaluation of the spectral integral for edge diffraction
- [x] an end point in the asymptotic evaluation of the spatial integral for edge diffraction

6. When an integral is characterized by two nearby saddle points in the integrand, it describes the phenomena of wave behaviour at

(a) A SURFACE CAUSTIC [x]

(b) A DISCONTINUITY IN SURFACE IMPEDANCE [ ]

(c) A WIRE SCATTERER [ ]

(d) None of the above cases [ ]

7. A slow wave propagates along a surface with a phase velocity that is:

(a) faster than the speed of light [ ]

(b) slower than the speed of light [x]

8. The extremal (usually a minimum) distance between two points on a smooth convex surface is:

(a) an involute [ ]

(b) a geodesic [x]

(c) an evolute [ ]

9. State if the following statements are TRUE or FALSE :

		TRUE	FAL.
(a)	GTD = GO + Diffraction	☒	☐
(b)	PTD = PO + Fringe (diffraction) correction	☒	☐
(c)	ITD = GO + Boundary diffraction Integral	☒	☐

10. The surface shadow boundary transition region fields for the radiation by antennas on a smooth convex surface are characterized by

(a) Fresnel integrals ☐
(b) Maliuzhinets functions ☐
(c) Fock functions ☒

11 If an antenna radiates when placed on a PEC spheroid, then by how much would the surface ray torsion change in the resulting UTD field calculation of the radiation pattern if the spheroid is moving at 0.8 times the speed of light toward an observer (in far zone) as compared to when the spheroid is at rest, and when the spheroidal motion is very close to a "massive" gravitational field of a collapsing star ? Show all details of calculation in the space below :