

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. An electric force  $\mathbf{F} = a_x xy - a_y 2x$  is applied along the quarter-circle from point  $A$  to point  $B$  as shown in Fig. 1. Find the total work done for it. (20%)
2. Derive the equation for representing the electric field intensity along the axis of a uniform line charge of length  $L$  with the uniform line-charge density  $\rho_l$ . (20%)
3. Basing on Maxwell's equation, derive the nonhomogeneous wave equations (a) for  $\mathbf{E}$  (10%), and (b) for  $\mathbf{H}$  (10%) in a simple medium.
4. It is known that the electric field intensity of a spherical wave along the positive  $R$  direction in free space is  $\mathbf{E} = a_\theta (E_0/R)(\sin\theta)(\cos(\omega t - kR))$ . Determine the magnetic field intensity  $\mathbf{H}$  and the value of  $k$ . (20%)
5. For a small rectangular loop with sides  $a$  and  $b$  that carries a current  $I$  as shown in Fig. 2, (a) Find the vector magnetic potential  $\mathbf{A}$  at a distant point  $P(x, y, z)$  (10%), and (b) Determine the magnetic flux density  $\mathbf{B}$  from  $\mathbf{A}$  (10%).

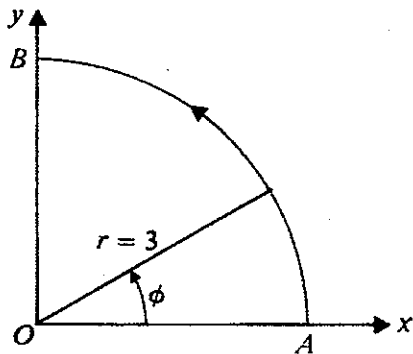


Fig. 1

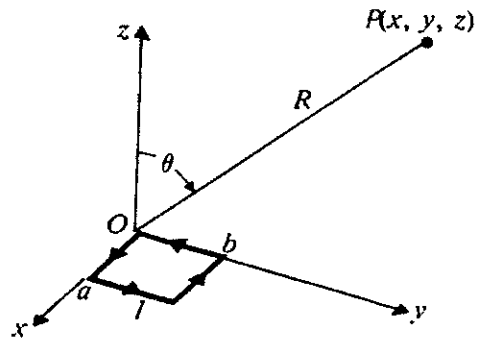


Fig. 2