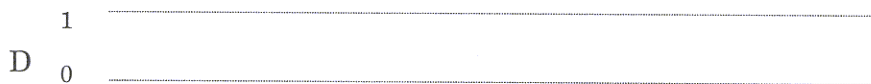
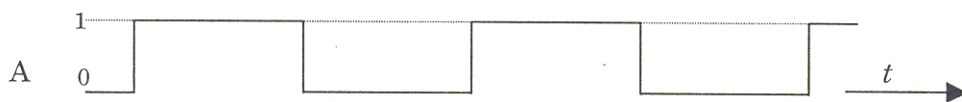
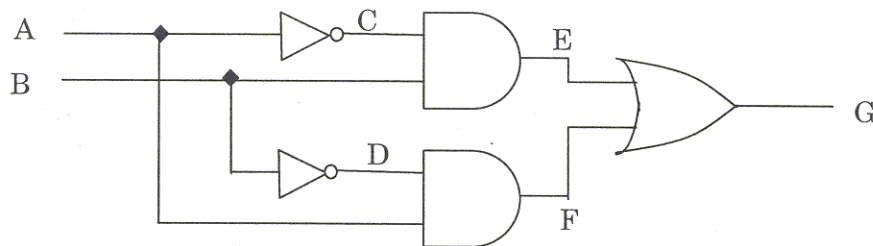
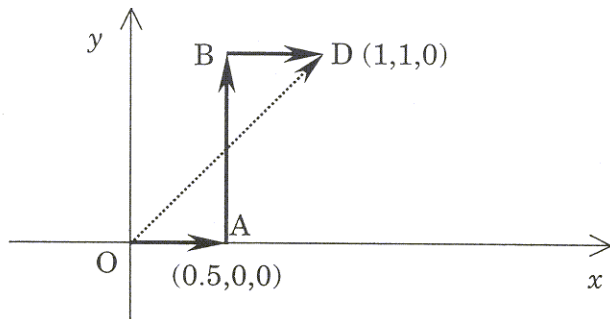


17. A logic circuit and the time varying logic levels applied at its A and B inputs are shown below. Sketch the corresponding output waveform at points C, D, E, F and G in the space given below the waveforms A and B.



18. (a) Determine whether the force represented by  $\vec{F}(x, y) = k \left[ (x^2 + y^2) \hat{i} + 2xy \hat{j} \right]$  is conservative or not. Here  $k = 1 \text{ Nm}^{-2}$ .
- (b) Calculate the work done by this force in moving a particle from the origin  $O(0,0,0)$  to the point  $D(1,1,0)$  on the  $z = 0$  plane along the paths  $OABD$  and  $OD$  as shown in the figure, where the coordinates are measured in metres.



19. A rod is moving with a speed of  $0.4c$  along its length in the positive  $x$ -direction, and a particle is moving along the negative  $x$ -direction with a speed  $0.8c$  as shown in the figure below. Both the speeds are measured in an inertial frame  $S$ , and  $c$  is the velocity of light in free space. The length of the rod as measured in the  $S$ -frame is  $3.6$  m.
- (a) Find the relative velocity of the rod (in terms of  $c$ ) in the rest frame of the particle.
- (b) Find (i) the time taken for the particle to cross the rod in the  $S$ -frame and in the rest frame of the rod, and (ii) time taken by the rod to cross the particle in the rest frame of the particle.

