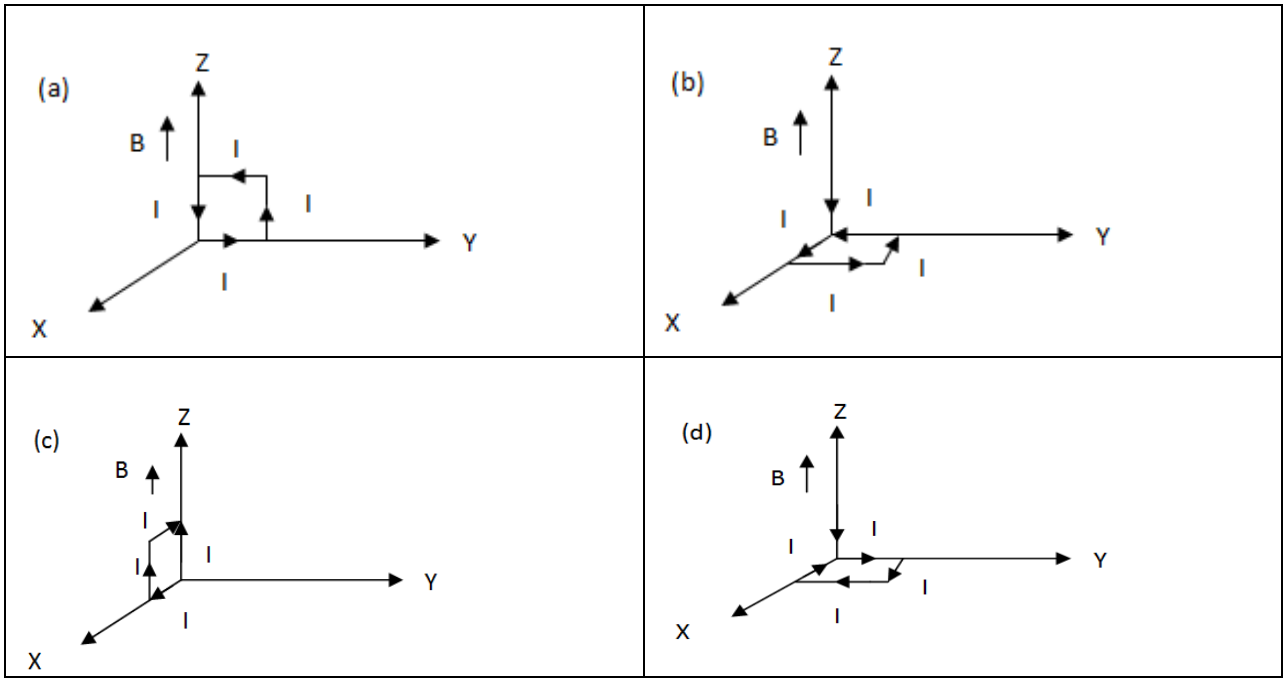
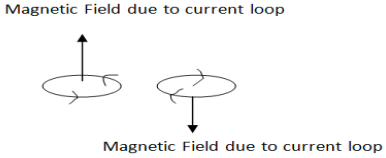
21. A rectangular loop of sides 10 cm and 5 cm carrying a current I of 12 A is placed in different orientations as shown in the figures below:



If there is a uniform magnetic field of 0.3 T in the positive z direction, in which orientations the loop would be in (i) stable equilibrium and (ii) unstable equilibrium?

(1) (a) and (b), respectively (2) (a) and (c), respectively
(3) (b) and (d), respectively (4) (b) and (c), respectively

Answer: For stable equilibrium magnetic field produced to the current carrying loop should not interact with existing magnetic field along Z- axis, this is possible when current carrying loop also produces magnetic field along Z-axis. We know direction of thumb gives magnetic field direction while we rotate our right hand along the direction of current. Figure (b) is appropriate for this.



For unstable equilibrium magnetic field due to current loop should be along Negative Z-axis (Z' axis), figure (d) is appropriate for this.
Correct option is (3) b) and (d), respectively.