Q1:

Figure gives the angular momentum magnitude $L$ of a wheel versus time $t$. Rank the four lettered time intervals according to the magnitude of the torque acting on the wheel, greatest first.

A) D and B tie, then A and C tie
B) A and C tie, then D and B tie
C) B, D, then A and C tie
D) D, B, then A and C tie
E) A, B, D, C

Ans: D

From $\tau = \frac{dL}{dt}$

Q2:

If the system shown in figure is set in rotation about x-axis, find the torque that will produce an angular acceleration of 1.5 rad/s²?

Ans:

$I = \sum mr^2$

$= (3 \text{ kg})(3\text{ m})^2 + (2 \text{ kg})(3\text{ m})^2 + (2 \text{ kg})(3\text{ m})^2 + (4 \text{ kg})(3\text{ m})^2 = 99.0 \text{ kg.m}^2$

$\tau = I\alpha = (99)(1.5) = 149 \text{ N.m.}$

Q3:

A horizontal 81.6 kg merry-go-round of radius 1.50 m is started from rest by a constant horizontal force of 50.0 N applied tangentially to the merry-go-round. Find the angular speed of the merry-go-round after 3.00 s. (Assume it is a solid cylinder.)

Ans:

$I = \frac{1}{2} MR^2 = 91.8 \text{ kg.m}^2$

$\alpha = \frac{\tau}{I} = \frac{FR}{I} = \frac{50 \times 1.5}{91.8} = 0.817 \text{ rad/s}^2$

$\omega = \omega_0 + \alpha t = 0 + (0.817)(3) = 2.45 \text{ rad/s}$