TOPIC
Engineering Mechanics (Statics and Dynamics) – Section VII – Question 9

QUESTION
A body is traveling in a straight line. The equation of motion is given by
$$x(t) = 5t^3 + 3t^2 - 6t$$
where
  x is given in meters, and
  t is given in seconds.
The acceleration of the body in m/s² at t = 5.25 seconds most nearly is
  (A) 6.000
  (B) 163.5
  (C) 436.8
  (D) 752.9

HINT
Acceleration= $\frac{d^2x}{dt^2}$. So differentiate the expression of location x, twice with respect to time to get the expression for acceleration.

SOLUTION
The velocity
$$v = \frac{dx}{dt}$$
$$= \frac{d}{dt}(5t^3 + 3t^2 - 6t)$$
$$= 15t^2 + 6t - 6$$

The acceleration is given by
$$a = \frac{dv}{dt}$$
$$= \frac{d}{dt}(15t^2 + 6t - 6)$$
$$= 30t + 6$$
$$= 30 \times 5.25 + 6$$
$$= 163.5 \text{m/s}^2$$

ANSWER
(B)

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