XE-2013

EE24BTECH11033 - KOLLURU SURAJ

Common Data for Questions 1 and 2

The wave and eddy resistance of a sea-going vessel, 96 m in length, driven at a velocity of 12 m/s, is to be determined. For this purpose, a 1/16th scale model is employed in fresh water, and the coefficient of resistance C_{we} of the model is found to be 1.47×10^{-4}. The quantity C_{we} is defined as:

$$C_{we} = \frac{F_{we}}{\left(\frac{\rho V^2 L^2}{2}\right)}$$

where F_{we} is the wave and eddy resistance, ρ is the density, V is the velocity, and L is the characteristic length. The density of sea water is 1026 kg/m^3.

1) The velocity in m/s, at which the model is towed, is (XE-2013)

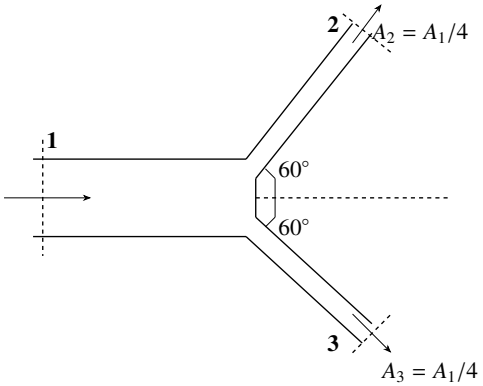
a) 0.75 b) 1.33 c) 3 d) 192

2) The resistance of the prototype, in kN, is (XE-2013)

(A) 6 (B) 25 (C) 26.9 (D) 100.1

Statement for Linked Answer Questions 3 and 4

Water enters a symmetric forked pipe and discharges into the atmosphere through the two branches as shown in the figure. The cross-sectional area of section-1 is 0.2 m^2, and the velocity across section-1 is 3 m/s. The density of water may be taken as 1000 kg/m^3. The viscous effects and elevation changes may be neglected.



3) The gauge pressure at section-1, in kPa, is (XE-2013)

a) 0.6 b) 13.5 c) 135 d) 600

4) The magnitude of the force, in *kN*, required to hold the pipe in place, is (XE-2013)

a) 2.7 b) 5.4 c) 19 d) 27

5) As temperature increases, diffusivity of an atom in a solid material, (XE-2013)

a) increases
b) decreases
c) remains constant
d) depends on the specific material

6) Which of the following is NOT correct? (XE-2013)

a) Dislocations are thermodynamically unstable defects.
b) Dislocations can move inside a crystal under the action of an applied stress.
c) crew dislocations can change the slip plane without climb
d) Burger's vector of an edge dislocation is parallel to the dislocation line.

7) At a constant atmospheric pressure, the number of phases, P which coexist in a chosen system at equilibrium, is related to the number of components, C in the system and the degree of freedom, F by (XE-2013)

a) P+F=C-2
b) P+F=C+2
c) P+F=C+1
d) P+F=C-1

8) Which one of the following metals is commonly alloyed with iron to improve its corrosion resistance? (XE-2013)

a) Co
b) Cr
c) Ti
d) Nb

9) The number of slip systems in a metal with FCC crystal structure is (XE-2013)

a) 4
b) 6
c) 8
d) 12

10) Upon recrystallization of a cold worked metal, (XE-2013)

a) strength increases and ductility decreases
b) strength decreases but ductility increases
c) both strength and ductility increase
d) both strength and ductility decrease

11) In carbon fiber reinforced resin composites, for a given fiber volume content, the Young's modulus varies depending on the orientation of the fibers relative to the direction of the applied load. Which fiber orientation will yield the maximum possible Young's modulus in this composite material? (XE-2013)

a) transverse
b) longitudinal
c) random
d) both transverse and longitudinal

12) Vulcanization is related to (XE-2013)

a) strengthening of rubber
b) extrusion
c) injection moulding
d) addition polymerisation

13) Which one of the following oxides crystallizes into fluorite structure? (XE-2013)

a) UO_2
b) MgO
c) $BaTiO_3$
d) $MgAl_2O_4$