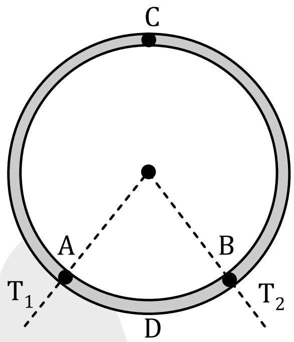
DPP 01

Q.1 A ring consisting of two parts ADB and ACB of same conductivity K carries an amount of heat H. The ADB part is now replaced with another metal keeping the temperatures T_1 and T_2 constant. The heat carried increases to 2H. The conductivity of the new ADB part if it is given that $\frac{ACB}{ADB} = 3$, is



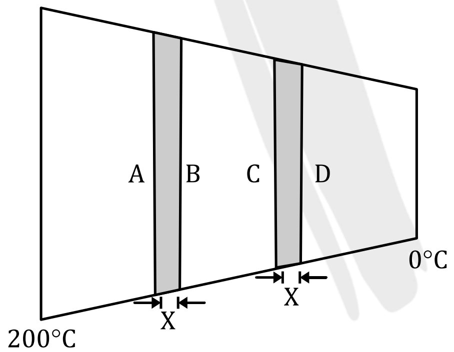
(A) $\frac{7}{3}K$

(B) 2K

(C) $\frac{5}{2}K$

(D) 3K

Q.2 Two ends of a conducting rod of varying cross-section are maintained at 200°C and 0°C respectively. In steady state



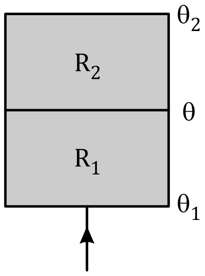
(A) temperature difference across AB and CD are equal

(B) temperature difference across AB is greater than that of across CD

(C) temperature difference across AB is less than that of across CD

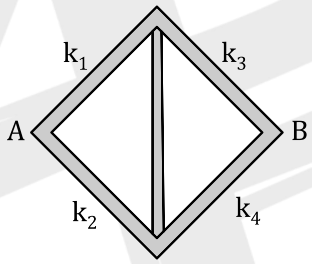
(D) temperature difference may be equal or different depending on the thermal conductivity of the rod

Q.3 Consider the two insulating sheets with thermal resistances R_1 and R_2 as shown in figure. The temperature θ is



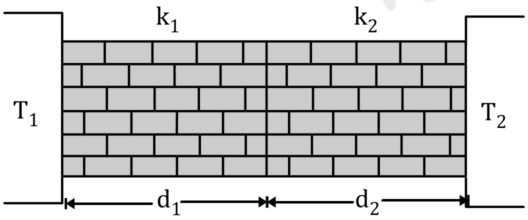
(A) $\frac{\theta_1\theta_2 R_1 R_2}{(\theta_1+\theta_2)(R_1+R_2)}$
(B) $\frac{\theta_1 R_1+\theta_2 R_2}{R_1+R_2}$
(C) $\frac{(\theta_1+\theta_2)R_1 R_2}{R_1^2+R_2^2}$
(D) $\frac{\theta_1 R_2+\theta_2 R_1}{R_1+R_2}$

Q.4 Five rods having thermal conductivities k_1, k_2, k_3, k_4 and k_5 are arranged as shown. The points A and B are maintained at different temperatures such that no thermal current flows through the central rod.



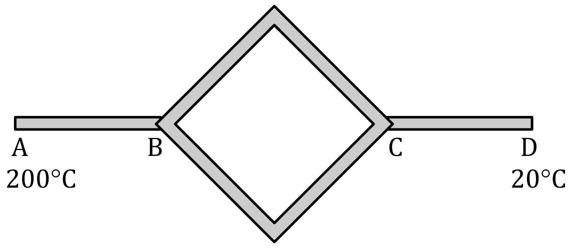
(A) $k_1 k_4 = k_2 k_3$
(B) $k_1 = k_3, k_2 = k_4$
(C) $k_1 k_3 = k_2 k_4$
(D) $\frac{k_1}{k_4} = \frac{k_3}{k_2}$

Q.5 Two walls of thickness d_1 and d_2, thermal conductivities k_1 and k_2 respectively are in contact. If the temperatures at the outer surfaces are T_1 and T_2 respectively, then the temperature at the interface in steady state is



(A) $\frac{k_1 T_1+k_2 T_2}{k_1+k_2}$
(B) $\frac{k_1 T_1 d_2+k_2 T_2 d_1}{k_1 d_2+k_2 d_1}$
(C) $\frac{k_1 T_1 d_1+k_2 T_2 d_2}{k_1 d_1+k_2 d_2}$
(D) $\frac{T_1+T_2}{2}$

Q.6 Six identical conducting rods are joined as shown in figure. Points A and D are maintained at temperatures 200°C and 20 °C respectively. The temperature of junction B will be



(A) 120°C (B) 100°C (C) 140°C (D) 80°C

Q.7 Two rods of copper and brass ($K_C > K_B$) of same length and area of cross-section are joined as shown. End A is kept at 100°C and end B at 0°C. The temperature at the junction

(A) will be more than 50°C

(B) will be less than 50°C

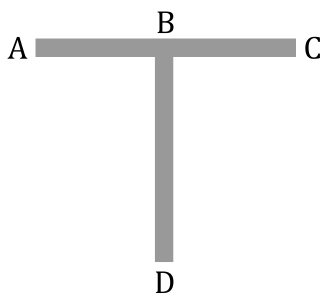
(C) will be 50°C

(D) may be more or less than 50°C depending upon the size of rods

Q.8 Two slabs A and B having lengths l_1 and l_2, respectively, and having same cross-section have thermal conductivities K_1 and K_2 respectively. They are placed in contact and constant temperature difference is maintained across the combination. The ratio of the quantities of heat flowing through A and B in a given time is

(A) $\frac{K_1}{l_1} : \frac{K_2}{l_2}$ (B) $\frac{K_1}{l_2} : \frac{K_2}{l_1}$ (C) $K_1 l_1 : K_2 l_2$ (D) $1 : 1$

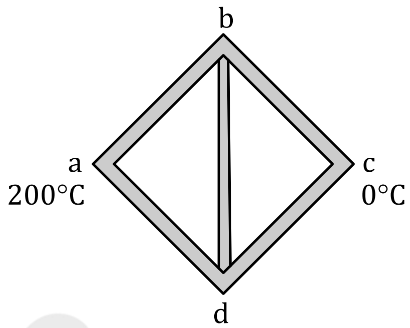
Q.9 Three conducting rods of same material and cross-section are shown in figure. Temperature of A, D and C are maintained at 20°C, 90°C and 0°C. The ratio of lengths of BD and BC if there is no heat flow in AB is



(A) $\frac{2}{7}$ (B) $\frac{7}{2}$ (C) $\frac{9}{2}$ (D) $\frac{2}{9}$

Paragraph for Q.10 to Q.11

Five rods of same material and same cross section are joined as shown. Lengths of rods ab, ad and bc are l, 2l and 3l respectively. Ends a and c are maintained at temperatures 200°C and 0°C respectively.



Based on the above facts, answer the following questions.

Q.10 The length x of rod dc for which there will be no heat flow through rod bd is

(A) 4l (B) 2l (C) 6l (D) 9l

Q.11 Then temperature of junction b or d is

(A) 120°C (B) 160°C (C) 90°C (D) 150 °C

ANSWER KEY

1.	(A)	**2.**	(C)	**3.**	(D)	**4.**	(A)	**5.**	(B)	**6.**	(C)	**7.**	(A)
8.	(D)	**9.**	(B)	**10.**	(C)	**11.**	(D)						