THE HONG KONG POLYTECHNIC UNIVERSITY

HONG KONG COMMUNITY COLLEGE

Subject Title : Engineering Materials **Subject Code** : CCN2249

Session : Semester One, 2018/19

Numerical Answers

Question B1

$\varepsilon_z = 74.9591$ mm

Question B2

$T_A = 87.0958$ Nm
$T_B = 37.9042$ Nm

Question B3

(a) The maximum internal crack $= 0.0148$ mm

(b) $K_c = 1.4434$

Question C1

(a) $PD_{100} = \frac{0.1875}{R^2}$

$PD_{110} = \frac{0.2652}{R^2}$

$PD_{111} = \frac{0.1038}{R^2}$

(b) $PD_{110} > PD_{100} > PD_{111}$
The two slip systems are
$(110)[1\bar{1}1]$ or $(110)[\bar{1}1\bar{1}]$
$(110)[\bar{1}11]$ or $(110)[1\bar{1}\bar{1}]$

(c) For $[1\bar{1}1]$ direction,
$\tau_R = -14.2287$ MPa

For $[\bar{1}11]$ direction
$\tau_R = 14.2287$ MPa

For $[1\bar{1}0]$ direction,
$\tau_R = -17.5$ MPa

Question C3

(a)(i) about 1wt% Sn, about 11.5wt%

(a)(ii) about 150°C

(a)(iv) at 138.5°C, at about 190°C

(a)(v) $C_1 = 30\text{wt\% Bi}, C_\beta = 99\text{wt\% Bi}, C_\alpha = 11.5\text{wt\% Bi}$

$W_\alpha = 0.7886, W_\beta = 0.2114$

(b)(i) $\sigma_0 = 25\ \text{MPa}$, $k_y = 12.5\ \text{MPa}\sqrt{\text{mm}}$ (based on the points selected)

(b)(ii) $\sigma_y = 275\ \text{MPa}$