Name and surname:
No:

Marmara University - Engineering Faculty
MSE 201 - Materials Science –I-R

Q.1 a) Write the electron configurations of the following elements by using spdf notion :
   1) Vanadium (V, 23) 2) Magnesium (Mg, 12)   3) Krypton (Kr,36)
   b) Briefly describe ionic bonding.
Q.2 Sketch within a cubic unit cell the following planes
      1) a) (011)   b) (112)   c) (123)
      2) Calculate the planar density of the (111) plane for FCC.
Q.3 Sketch within a cubic unit cell the following directions
      1) a) [011]   b) [112]   c) [123]
      2) Calculate the linear density of the [110] direction for BCC
Q.4 a) For an ASTM grain size of 7, approximately how many grains would there be per square inch in a micrograph taken at a magnification of 200X.
   b) What is the composition, in atom percent, of an alloy that consists of 30wt% Zn and 70wt% Cu.?
         Acu=63.55 amu   Azn=65.39 amu
Q.5 a) Calculate atomic packing factor for BCT (Tetragonal body) (c/a=1.633)
   b) Classify defects.
   c) Classify diffusion coefficients due to diffusion paths.
Q.6 Determine the carburizing time necessary to achieve a carbon concentration of 0.30 wt % at a position 1.5 mm into an iron-carbon alloy that initially contains 0.10 wt %C. The surface concentration is to be maintained at 1.0 wt C, and the treatment is to be conducted at 950°C.
      Do= $2.3*10^{-5}$ m²/s,   Q=148 000 J/mol   R=8.31 J/mol K

Table 5.1   **Tabulation of Error Function Values**

z	$erf(z)$	z	$erf(z)$	z	$erf(z)$
0	0	0.55	0.5633	1.3	0.9340
0.025	0.0282	0.60	0.6039	1.4	0.9523
0.05	0.0564	0.65	0.6420	1.5	0.9661
0.10	0.1125	0.70	0.6778	1.6	0.9763
0.15	0.1680	0.75	0.7112	1.7	0.9838
0.20	0.2227	0.80	0.7421	1.8	0.9891
0.25	0.2763	0.85	0.7707	1.9	0.9928
0.30	0.3286	0.90	0.7970	2.0	0.9953
0.35	0.3794	0.95	0.8209	2.2	0.9981
0.40	0.4284	1.0	0.8427	2.4	0.9993
0.45	0.4755	1.1	0.8802	2.6	0.9998
0.50	0.5205	1.2	0.9103	2.8	0.9999