END SEMESTER EXAMINATION (2017-18)

B.Tech (Biotechnology) III[rd] Semester

Subject: Biomaterial Science and Engineering (AM-1305)

0 Hrs. M.M. - 60 Marks

All questions are compulsory.
Assume missing data suitably.

Fill in the blanks. (8x1)

A. Maximum Carbon content in 316l. Stainless Steel is _____.

B. Nylon is also called as _____.

C. HEMA stands for _____.

D. Materials having similar properties in all directions called as _____ material.

E. The Bone is composed of _____

F. UHMWPE stands for _____

G. HAPEX stands for _____

H. Polymer known as bone cement is called_____

Answer the following. (5x3)

A. What do you mean by Biomaterials? Explain the term Bio-compatibility and Bio-functionality.

B. Copper has an atomic radius of 0.128 nm, an FCC crystal structure, and an atomic weight of 63.5 g/mol. Compute the theoretical density of the crystal.

C. What do you mean by crystal imperfections? Explain Line imperfections and its types in detail

D. What do mean by Miller indices. Explain the symbolic representation of family of Point, Direction and Plane for cubic crystal. Draw the Miller indices for (110) and $(0\bar{1}1)$ for simple cubic structure.

E. The following data were obtained for polymethyl acrylate. [monomer $H_2C=CHCOOCH_3$]

Mean M.W. (g/Mol)	Weight (g)	Number fraction
20000	2.0	0.5
40000	1.0	0.4
30000	1.0	0.1

i. Calculate Mn and Mw of this polymer?

ii. What is polydispersity index?

iii. What is degree of polymerization?

3. What do you mean by shape memory alloys? What are the various mechanical properties and applications of shape memory alloys. (6)

4. Write a note on biodegradable polymers used for various tissue engineering applications. (5)

5. Compare the mechanical, physical & chemical properties of Co-based alloys with different types of Ti - based alloys used for biomedical applications. Also write advantages of Ti – based alloys over Co – based alloys used for making implants. (6)

6. What do you mean by type I, II, III & IV ceramics used for biomedical applications? Discuss bioactive ceramics and bio resorbable ceramics in detail. (6)

7. Write in detail about physical, chemical and mechanical properties with their various biomedical applications of following biomaterials:
i)Polyurethane ii) Silicone Rubber iii) PolyHEMA iv) PTFE v) PGA vi) Smart Polymers vii) Dental Amalgam. (7 x 2)