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3 Hours / 100 Marks

Seat No.

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- Instructions :** (1) All Questions are *compulsory*.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Use of Non-programmable Electronic Pocket Calculator is permissible.

- | | Marks |
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| 1. (A) Attempt any THREE : | 12 |
| (a) List four defects occurring in solid material. | |
| (b) Give four applications of Ti and its alloys. | |
| (c) Sketch (i) disk-in-cage (ii) ball-in-cage prosthetic heart valve. | |
| (d) State the use of impression materials used in dentistry and give its example. | |
| (B) Attempt any ONE : | 6 |
| (a) State what do you mean by enamel and give its mechanical properties. | |
| (b) Give the categorization of hard tissue replacement materials according to their compatibility with bony tissue. | |
| 2. Attempt any FOUR : | 16 |
| (a) The greatest tensile stress which steel of a particular sort can withstand without breaking is about 10^9 Nm^{-2} . A wire of cross section area 0.01 mm^2 is made of this steel. What is the greatest force that it can withstand ? | |
| (b) Give any four major historical developments of biomaterials along with year and inventor. | |

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- (c) Give four mechanical properties of Ti and its alloys.
- (d) Give four mechanical properties of any one alloy of carbon.
- (e) State the need for vascular implant and give material used for the same.
- (f) Give name of any four materials used for deep cavities filling.

3. Attempt any FOUR : **16**

- (a) Sketch stress-strain curve and explain it.
- (b) How materials can be protected from corrosion ?
- (c) Give four applications of collagen.
- (d) State four functions of kidney.
- (e) State the meaning of temporary fixation devices and give its two examples.

4. (A) Attempt any THREE : **12**

- (a) Describe any four bonds present in atoms.
- (b) Give four applications of carbon.
- (c) State two types of blood clot formation techniques and differentiate them.
- (d) Sketch detailed structure of osteon.

(B) Attempt any ONE : **6**

- (a) Write the procedure for testing the reliability of dental implants and list the materials used in porous dental implants.
- (b) Draw the structure of typical bone composition and comment on its electrical stimulation on bone healing.

5. Attempt any FOUR : **16**

- (a) Define biomaterials and give its classification.
- (b) Give names of four resorbable ceramics.

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- (c) Give four applications of hydrogel.
- (d) List advantage and disadvantage of PMMA and UHMWPE with reference to total knee replacement.
- (e) Give the biological tolerance for the following metals in human body :
 - (i) Nickel
 - (ii) Chromium
 - (iii) Titanium
- (f) List three biomaterials used in total joint replacement along with their area of application.

6. Attempt any FOUR :

16

- (a) State four cellular events in bone healing.
 - (b) Sketch the diagram showing vitreous implant and give its drawbacks.
 - (c) State the function of eye shields and list polymers used for its manufacturing.
 - (d) Draw neat labelled diagram of Hollow fiber dialyzer.
 - (e) State need for cardiac pacemaker.
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