JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2025

B.Tech-VIII Semester (Open Elective)

COURSE CODE (CREDITS): 24B1WPH831 (03) MAX. MARKS: 15

COURSE NAME: Biomaterials

COURSE INSTRUCTORS: Ragini Raj Singh MAX. TIME: 1 Hour

Note: *(a) All questions are compulsory.*
(b) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems
(c) Use of calculator is allowed

<table>
<tr><th>Q.No</th><th>Question</th><th>CO</th><th>Marks</th></tr>
<tr><td>Q1</td><td>(a) Discuss the essential fields of knowledge required for development of biomaterials; and how they are connected?
b) How you can differentiate between transplant and Implant?</td><td>1</td><td>1.5
1.5</td></tr>
<tr><td>Q2</td><td>(a) Classify the biomaterials with their advantages.
(b) Based on your understanding what are the criteria to select biomedical materials?</td><td>1</td><td>1.5
1.5</td></tr>
<tr><td>Q3</td><td>(a) Discuss friction and wear failure in biomaterials.
(b)What are some applications of visco-elastic Materials?</td><td>1</td><td>1.5
1.5</td></tr>
<tr><td>Q4</td><td>The following data were recorded during the tensile test of a 14-mm-diameter mild steel rod. The gage length was 50 mm.
<table><tr><th>Load (N)</th><th>Elongation (mm)</th><th>Load (N)</th><th>Elongation (mm)</th></tr><tr><td>0</td><td>0</td><td>46 200</td><td>1.25</td></tr><tr><td>6 310</td><td>0.010</td><td>52 400</td><td>2.50</td></tr><tr><td>12 600</td><td>0.020</td><td>58 500</td><td>4.50</td></tr><tr><td>18 800</td><td>0.030</td><td>68 000</td><td>7.50</td></tr><tr><td>25 100</td><td>0.040</td><td>59 000</td><td>12.5</td></tr><tr><td>31 300</td><td>0.050</td><td>67 800</td><td>15.5</td></tr><tr><td>37 900</td><td>0.060</td><td>65 000</td><td>20.0</td></tr><tr><td>40 100</td><td>0.163</td><td>65 500</td><td>Fracture</td></tr><tr><td>41 600</td><td>0.433</td><td></td><td></td></tr></table>Plot the stress-strain diagram and determine the following mechanical properties: (a) proportional limits; (b) modulus of elasticity; (c) yield point; (d) ultimate strength; and (e) rupture strength (Fracture) .</td><td>2</td><td>3</td></tr>
<tr><td>Q5</td><td>(a) A steel rod having a cross-sectional area of 600 mm^2 and a length of 300 m is suspended vertically from one end. It supports a tensile load of 30 kN at the lower end. If the unit mass of steel is 7850 kg/m^3 and E = 200 × 10^3 MN/m^2, find the total elongation of the rod.

(b) A rod 200 cm long and of diameter 3.0 cm is subjected to an axial pull of 20 kN. If the modulus of elasticity of the material of the rod is 2 x 10^5 N/mm^2, determine:
(i) the stress; (ii) the strain, and (iii) the elongation of the rods.</td><td>2</td><td>1.5

1.5</td></tr>
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