7. A 80 mm long journal bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of the oil is 0.021 Kg/m-s at the operating temperature. If the bearing is capable of dissipating 80 J/s, determine the maximum safe speed **15**

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020403

May 2026

B.Tech. (RAI) (Fourth Semester)

Design of Machine Elements (RAU-206-V)

Time : 3 Hours] [*Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other. Use of design data handbook is allowed.

Part A

1. (a) What are different types of screw threads ? Explain with diagrams. **1.5**

(b) What are the various design considerations for mechanical design ? **1.5**

(c) Explain different types of composite material. 1.5

(d) What do you mean by diamond riveting joint ? 1.5

(e) What are applications of knuckle joint ? 1.5

(f) What are the different types of keys ? 1.5

(g) What are different types of gears ? 1.5

(h) What is difference between ball & roller bearing ? 1.5

(i) What is use of tangent key ? 1.5

(j) What is eccentric loading ? 1.5

Part B

2. (a) Draw freehand isometric and orthographic projections for a triple rivetted, single cover plate, chain butt joint mentioning all important parameters. 10

(b) What do you mean by Limit, Fits and Tolerances ? Explain in detail with relevant diagrams. 5

3. (a) What is FOS ? What are different factors affecting selection of FOS ? 5

(b) What is Failure Theories. ? Explain in detail. 10

4. What is FRP ? Explain in detail rule of mixture and advantage over other materials. 15

5. Two lengths of mild steel tie rod having width 200 mm and thickness 12.5 mm are to be connected by means of a butt joint with double cover plates. Design the diamond joint if the permissible stresses are 80 MPa in tension, 65 MPa in shear and 160 MPa in crushing. Make a sketch of the joint. 15

6. (a) What are different types of keys ? Explain with diagram. 5

(b) Design a muff coupling to connect two shafts for 25 kW at 360 rpm. The shaft and key are made of plain carbon steel (S_y = 400 N/mm^2). The sleeve is made of grey cast iron (S_{ut} = 200 N/mm^2). The F.O.S for shaft and key is 4 while for sleeve is 6. 10