

7. A bronze spur pinion rotating at 600 r.p.m. drives a cast iron spur gear at a transmission ratio of 4 : 1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard  $20^\circ$  full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the standpoint of strength. 15

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**020403**

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**B. Tech. (RAI) (Fourth Semester)**

**Design of Machine Elements**

**(PCC-RAI-403/21)**

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. Design Data Handbook is allowed.

#### **Part A**

1. (a) What is Fit and what are its types ? 1.5  
(b) What is Sectioning ? Explain with diagram. 1.5  
(c) Explain S-N curve. 1.5  
(d) What is stress concentration ? 1.5

- (e) What are the different types of reinforcements in composite materials ? 1.5
- (f) Why zig-zag type pattern is more useful than chain riveting ? 1.5
- (g) Draw different types of welded joints. 1.5
- (h) What is function of spline key ? 1.5
- (i) What is difference between ball and roller bearing ? 1.5
- (j) What is helix angle in gears ? 1.5

### Part B

- 2. Draw freehand isometric and orthographic projections for a double riveted, double cover plate, chain riveting butt joint mentioning all important parameters. 15
- 3. (a) What is factor of safety ? What are factors to be considered for FOS ? 5
  - (b) Explain general considerations and procedure of design of machine elements. 10
- 4. Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90 kW at 250 r.p.m.

The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed  $1^\circ$  in a length of 20 diameters. The allowable shear stress in the coupling bolts is 30 MPa. 15

- 5. (a) What are factors to be considered for selection of material ? 5
  - (b) What are composite materials ? Explain, how composite materials are more useful than conventional materials. 10
- 6. (a) What are different types of riveted joints ? 5
  - (b) A welded connection, as shown in Fig. 1, is subjected to an eccentric force of 60 kN in the plane of the welds. Determine the size of the welds, if the permissible shear stress for the weld is 100 N/mm<sup>2</sup>. Assume static conditions. 10

