Code No: RT31033 **R13** SET - 1

III B. Tech I Semester Supplementary Examinations, May - 2016
DESIGN OF MACHINE MEMBERS – I
(Mechanical Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**
(Data books may be allowed)
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PART –A

1	a)	Define any four theories of failure.	[4M]
	b)	Draw S-N Curve and mark all salient points.	[4M]
	c)	How do you obtain a bolt of uniform strength?	[4M]
	d)	Write notes on Types of keys.	[3M]
	e)	Draw split coupling.	[4M]
	f)	What are the functions of springs?	[3M]

PART -B

2	a)	What are the general considerations in the design of machine elements?	[4M]
	b)	A cast iron pulley transmits 10 KW at 400 rpm. The diameter of the pulley is 1.2meter and it has four straight arms of elliptical cross section. In which the major axis is twice the minor axis. Determine the dimensions of the arm if the allowable bending stress is 15 MPa.	[8M]
	c)	Explain simple stresses.	[4M]
3	a)	Explain Goodman failure theory.	[3M]
	b)	A circular bar of 0.5 m length is supported freely at its two ends. It is actedupon by a central concentrated cyclic load having a minimum value of 20 kN and a maximum value of 50 kN. Determine the diameter of bar by taking a factor of safety of 1.5, size factor of 0.85, surface finish factor of 0.9. The material properties of bar is given by: Ultimate strength of 650 MPa, Yield strength of 500 MPa and Endurance strength of 350 MPa.	[8M]
	c)	Draw S-N curve for mild steel and explain its significance.	[5M]
4	a)	How the strength of transverse fillet weld is evaluated?	[4M]

b) A steel plate, 80 mm wide and 10 mm thick, is joined to another steel plate by means of a single transverse and double parallel fillet weld, as shown below Fig. 1. The strength of the welded joint should be equal to the strength of the plate to be joined. The permissible tensile and shear stresses for the weld material and the plates are 100 MPa and 70 MPa respectively. Find the length of each parallel fillet weld. Assume that the tensile force passes through the centre of gravity of three welds. [12M]

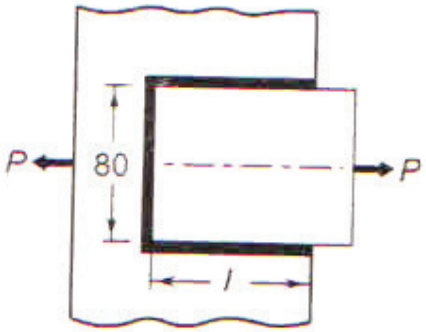

Fig. 1

5 a) Briefly explain the procedure to design a shaft based on any two theories of failures. [4M]

b) It is required to design a knuckle joint to connect circular shafts subjected to an axial force of 50 kN. The rods are coaxial and a small amount of angular movement between their axes is permissible. Design the joint and specify the dimensions of its components. The allowable tensile, compressive and shear stress in the rod and pin material is limited to 80MPa, 100MPa and 40MPa respectively. [12M]

6 a) Explain types of couplings. [4M]

b) A mild steel shaft has to transmit 70 kW at 240 rpm. The allowable shear stress in the shaft material is limited to 45MPa. Design a cast iron flange coupling. The shear stress in the coupling bolt is limited to 30MPa. [12M]

7 a) Explain co-axial springs. [4M]

b) A co-axial spring consists of two helical compression springs, one inside the other. The free length of the outer spring is 25 mm greater than the inner spring. The wire diameter and mean coil diameter of the inner spring are 8 mm and 64 mm respectively. Also the wire diameter and mean coil diameter of the outer spring are 10 mm and 80 mm respectively. The numbers of active coils in inner and outer springs are 10 and 15 respectively. Assume the same material for two springs and the modulus of rigidity of spring material is 81370 N/mm^2. Calculate [12M]

(i) The stiffness of the spring the deflection is from 0 to 25 mm

(ii) The stiffness of the spring the deflection is more than 25 mm.

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