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

III B. Tech I Semester Supplementary Examinations, October/November - 2018

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)	Write about types of fits?	[3M]
	b)	Differentiate the theoretical stress concentration factor and fatigue stress concentration factor.	[4M]
	c)	What do you mean by efficiency of riveted joint?	[3M]
	d)	Write the applications of sleeve and cotter joint?	[4M]
	e)	What is the importance of muff couplings?	[4M]
	f)	Write the applications of helical torsion springs?	[4M]

PART -B

2	a)	Explain the design considerations for the selection of Engineering Materials and their properties?	[8M]
	b)	Explain the concept of stiffness in tension, bending, torsion and combined situations?	[8M]
3	a)	Describe the modified Goodman's line theory for designing the components subjected to fatigue loads?	[6M]
	b)	A thin wall cylindrical pressure vessel of mean diameter of 60 cm is subjected to internal pressure varying from 0 to 40 MPa. Find the required thickness of the pressure vessel based on yield point of 400 MPa, endurance limit of 22 Mpa, and a factor of safety of 3. Use Soderberg criterion of failure.	[10M]
4	a)	What forms of rivet heads are used in boiler construction?	[4M]
	b)	A triple riveted lap joint is to be made between 6 mm plates. If the safe working stresses are ft= 84 MPa, fs= 60 MPa and fc= 120 MPa, calculate the rivet diameter, rivet pitch and distance between rows of rivets for the joint. Zig-zag riveting is to be used. State how the joint will fail.	[12M]
5	a)	A machinery shaft is subjected to torsion only. The bearings are 2.50 metre apart. The shaft transmits 190 kW at 220 rev/min. Allow a shear stress of 45 MPa after an allowance for keyways. i) Calculate the shaft diameter for steady loading and ii) Calculate the shaft diameter if the load is suddenly applied with minor shocks.	[12M]
	b)	Write the stresses in keys?	[4M]
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6 A bushed -pin type flexible coupling is used to connect two shafts and transmit 5kW power at 720 r.p.m. Shafts, keys and pins are made of commercial steel, ($\sigma_{yc}=\sigma_{yt}$ =240N/mm^2) and the factor of safety is 3. The flanges are made of grey cast iron FG200 (σ_{ut}=200N/mm^2) and the factor of safety is 6. Assume, $\sigma_{sy}=0.55\sigma yt$ and $\sigma_{su}=0.5\ \sigma_{ut}$. There are 4 pins. The pitch circle diameter of the pins is four times of shaft diameter. The permissible shear stress for pins is 35 N/mm^2. The permissible bearing pressure for rubber bushes is 1 N/mm^2. The keys have square cross section. Calculate: [16M]
i) diameter of shafts ii) dimensions of the key
iii) diameter of the pins iv) outer diameter and effective length of the bushes.

7 Design a spring for spring loaded safety valve for the following Conditions: Operating pressure 100 N/cm^2. Diameter of valve seat 100 mm. Design shear stress for the spring is 400 N/mm^2,G=0.86×10^{5}N/mm^2. The spring is to be kept in a casing of 120 mm inner diameter and 400 mm long. The spring should be at maximum lift of 6 mm when the pressure is 107.5 N/cm^2. [16M]

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