INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	**DESIGN OF MACHINE MEMBERS-I**
Course Code	:	**A50316**
Class	:	III B. Tech I Semester
Branch	:	ME
Year	:	2017 – 2018
Course Coordinator	:	Mr. G.V. R. Seshagiri Rao, Associate Professor
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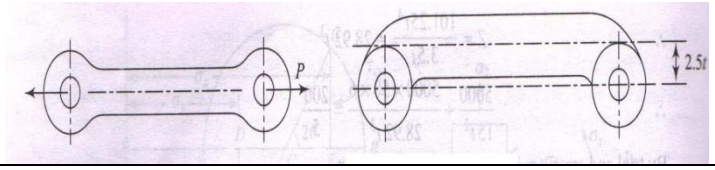
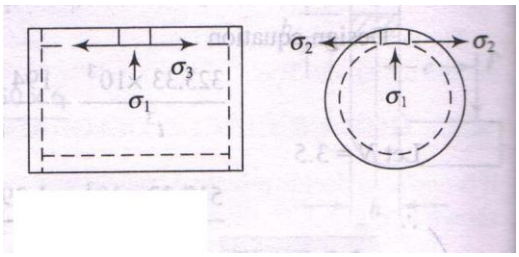
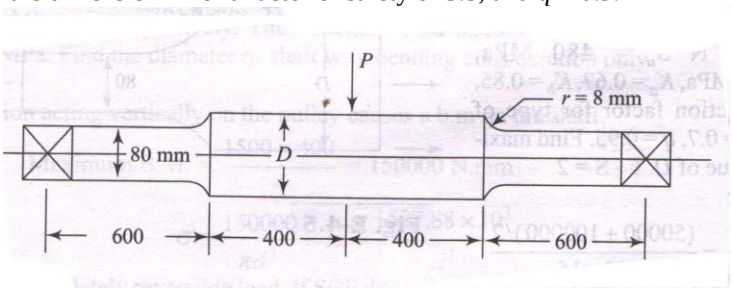
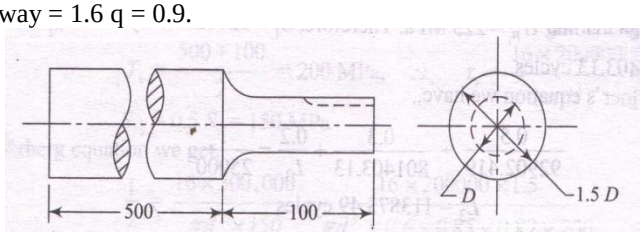
OBJECTIVES

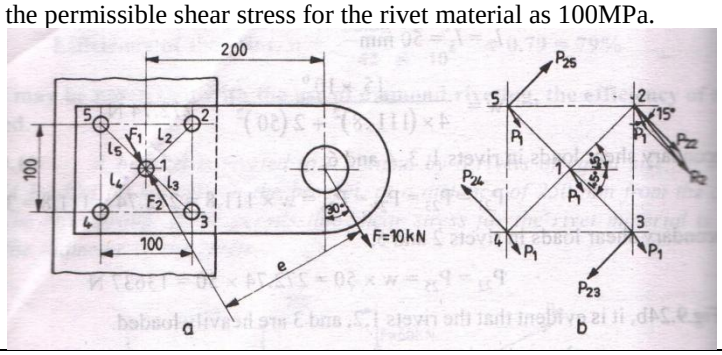
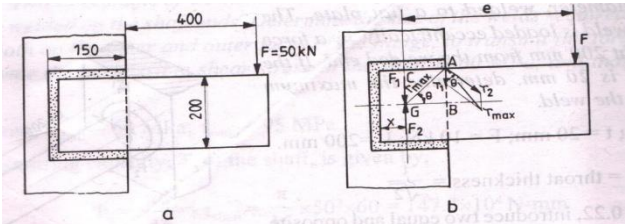
To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

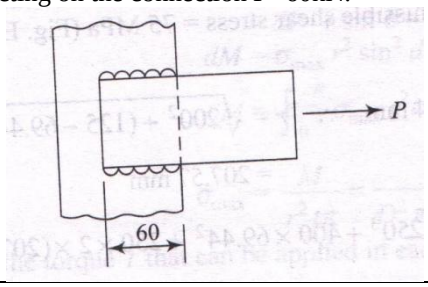
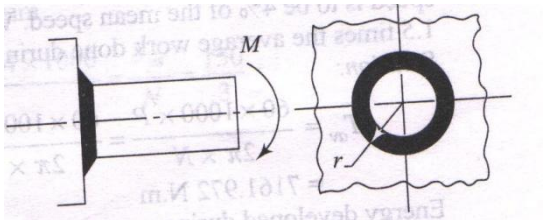
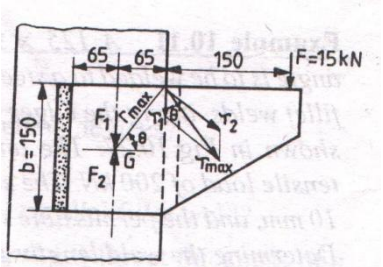
In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

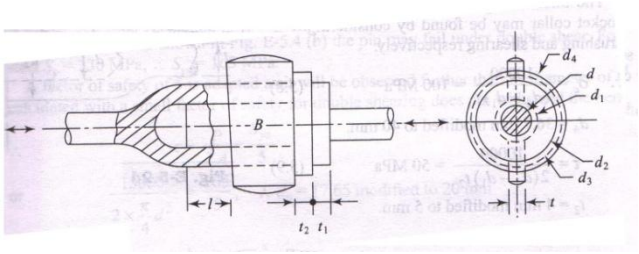
S No	QUESTION	Blooms taxonomy level	Course Outcomes
	UNIT – I **INTRODUCTION AND FATIGUE LOADING**		
Part - A (Short Answer Questions)			
1	List out various factors to be considered while designing a machine element	Remember	1
2	Illustrate the properties of non-metals	Understand	1
3	State the applications of non-metals in design	Understand	1
4	Write the difference between ductile and brittle	Understand	1
5	Define stiffness for axial loaded member	Understand	1
6	Write about factor of safety under static loading and fluctuating loads	Remember	1
7	Write short notes on design procedure based on strength and rigidity	Remember	1
8	Define fatigue	Remember	1
9	Define fatigue stress concentration factor	Remember	1
10	Define is stress concentration?	Apply	1
11	Define is Theoretical stress concentration factor	Understand	1
12	What is notch sensitivity?	Remember	1
13	Define factor of safety for fatigue loading	Remember	1
14	Define completely reversed loading	Remember	1
15	Define alternating loading	Remember	1

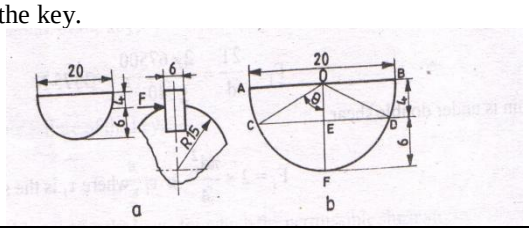
16	Define repeated loading	Understand	1
17	Write equation for mean average stress	Understand	1
18	Write equation for variable stress	Understand	1
19	Define stress ratio	Apply	1
20	Explain manufacturing consideration in design	Remember	1
Part - B (Long Answer Questions)			
1	a. Define "Machine Design". b. i) A symmetrical link shown in Fig. Carries a tensile force of 10kN. The ratio b/t =4 and material used is 30C8 with S_y=350 MPa. Find *b* and *t* with F.S=4. If shape of the link is modified as in Fig. E-3.4 ii) Determine increase in the width *b* and thickness't'. 	Understand	1
2	a. What is factor of safety? Why is it necessary? Why a very small or a very large factor of safety should not be used? b. A cylindrical boiler as shown in Fig. E-3.6, two metre diameter made of sheet metal 20n mm thick, is subjected to an internal pressure of 1.5 MPa. Find the factor of safety by using different theories of failure. S_y= 350 MPa. μ = 0.25. 	Analyzing	1
3	a. Define simple stress and give few examples of machine components subjected to simple stress. b. Determine the diameter of a ductile steel bar subjected to an axial tensile load of 40kN and a torsional moment of 16 x 10^5 N.mm. Use factor of safety of 1.5, E=2 x 105 MPa and S_y = 210 MPa.	Understand	1a
4	a. Define failure. What are the possible modes of failure? b. A shaft is designed based on maximum energy of distortion as the criteria of failure and factor of safety of 2. The material used is 30C8 steel with S_y = 310 MPa. The shaft is subjected to an axial load of 40 kN. Determine the maximum torque that can be applied to the shaft before yielding. Diameter of shaft is 20 mm.	Apply	1a
5	a. Design of a part subjected to bending moment is done on the basis of safe tensile stress. Why? b. A cylindrical shaft of outer diameter double the inner diameter is subjected to a bending moment of 15000 N. m and torque of 25000 N.m. Find the dimensions of shaft with F. S of 2.	Analyzing	1a
6	a. "Maximum shear stress theory is more reliable as compared to maximum principal stress theory under the state of biaxial stresses of opposite nature." Explain. b. A hub is press fitted on a shaft. An element in the hub is subjected to a radial compressive stress (Pressure) of 50 MPa and hoop stress of 75 MPa. Find the factor of safety if (i) hub is made of 30C8 steel with S_y = 350 MPa. Using maximum shear stress theory (ii) if the hub is made of C.I with S_{ut} = 200 MPa, S_{uc} = 700 MPa.	Understand	1

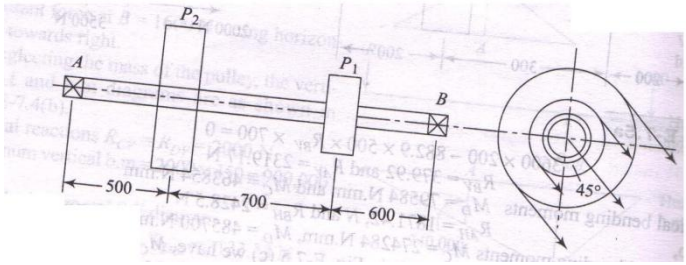
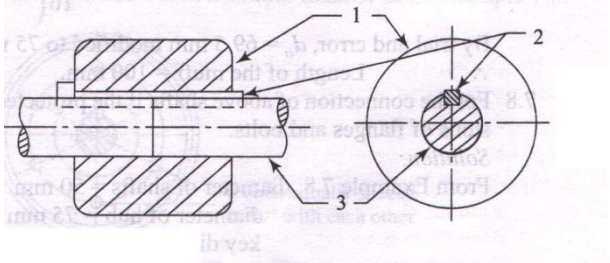
7	a. Explain which three theories of failure are applicable to ductile materials. b. Prove that for maximum shear stress theory $S_{ys} = 0.5\ S_y$ for pure shear and $S_{vs} = 0.577\ S_y$ for pure shear with energy of distortion theory.	Evaluate	1
8	The non-rotating shaft shown in Fig. E-4.7 is subjected to a load *P* varying from 4000 N to 12000 N. The material 30C8 steel has S_u = 600 MPa and S_e = 300 MPa. K_a = 0.8, K_b = 0.85 and K_c = 0.9. Find the dimension D for a factor of safety of 3.5, and q = 0.9. 	Apply	4
9	The endurance strength for a part is 280 MPa while S_u = 630 MPa. It is subjected to a loading as follows σ_{m1} = 315 MPa and σ_{v1} = 96 MPa for 80% of time σ_{m2} = 245 MPa and σ_{v2} = 145 MPa for 20% of time Find the expected life in number of cycles of reversals. Assume K_t = 1.5.	Apply	4
10	A shaft is subjected to a torque varying between 5000 N.m to 10000 N.m. The stress concentration factor due to the keyway is 2.5. S_u = 500 MPa, S_e = 0.5 S_u, S_y = 300 MPa, endurance correction factor = 0.6, size correction factor = 0.8 and surface correction factor = 0.82. Find the diameter of th shaft using F. S = 2	Understand	4
Part - C (Problem Solving and Critical Thinking Questions)			
1	A torque varying from 25kN. M to 75 kN. M is applied at the end of the shaft. Fillet radius $r = \frac{d}{8}$, factor of safety = 1.6, material is 40 MN 2512 with S_y = 350 MPa. S_e = 250 MPa, K_a = 0.85, K_b = 0.82, K_c = 0.6, SCF due to keyway = 1.6 q = 0.9. 	Apply	4
2	a. Define endurance test and endurance limit. b. A Shaft of diameter *d* is subjected to a torque varying between 100 N.m to 500 N.m . K_r due to keyway is 1.5. F.S = 2, S_y = 300 MPa, S_e = 200 MPa. Correction factor for torsion = 0.6. Surface finish factor = 0.85 and size factor = 0.82. Find the value of *d*.	Understand	4
3	a. What is stress concentration? How does it affect the fatigue strength? b. What are the different methods to reduce stress concentration?	Evaluate	1
4	a. Draw and explain the S-N diagram. b. A uniform bar having a machined surface is subjected to an axial load varying from 400kN to 150 kN. The material of the bar has S_u = 630 MPa. K_c = 0.7 and K_t = 1.42. Find the diameter *d* of the rod using F.S = 1.5.	Understand	2

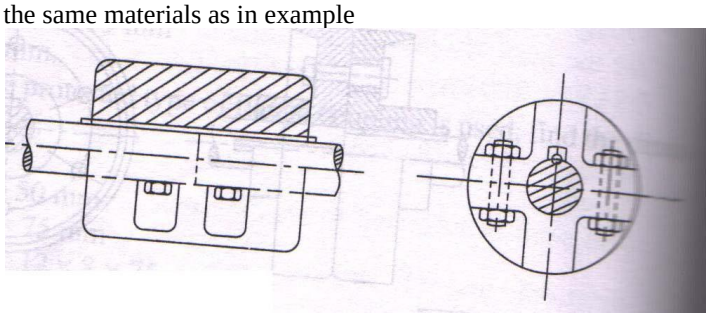
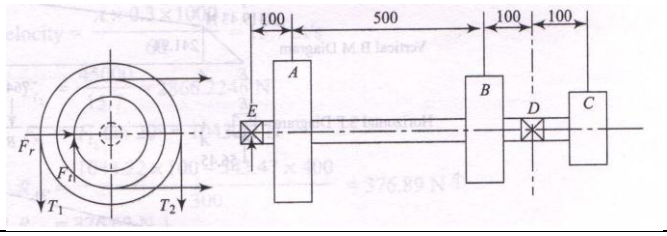
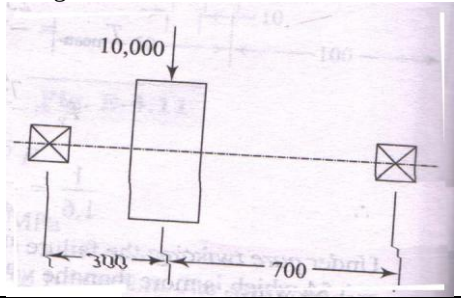
5	a. Differentiate between boiler and structural joints. b. Two plates of 16mm thick are joint by double riveted lap joint pitch of each of row of rivets is 90mm. rivets are 25mm in diameter permissible stresses are 140 MPa in tension. 80 MPa in shear & 160 MPa in crushing. Find efficiency of joint.	Apply	1
UNIT - II DESIGN OF FASTENERS AND WELDED JOINTS			
Part – A (Short Answer Questions)			
1	Explain the term riveted joint	Remember	2
2	Explain is caulking and why is it necessary	Remember	2
3	Explain diagonal pitch in riveted joint	Understand	2
4	Explain margin in riveted joint	Remember	2
5	Explain pitch in riveted joint	Remember	2
6	Explain back pitch in riveted joint	Remember	2
7	Explain uniform strength of riveted joint	Apply	2
8	Define term welding joint	Analyze	2
9	Difference between welding joint and riveted joint	Remember	2
10	Explain the advantages of welded joint	Remember	2
11	Explain the advantage of riveted joint	Remember	2
12	Explain the disadvantage of welded joint	Remember	2
13	Explain the disadvantage of riveted joint	Remember	2
14	Write the methods to make bolts and screws	Remember	2
15	Explain about gasket	Remember	2
16	Classify the types of riveted joints	Remember	2
17	Classify the types of rivets	Remember	2
18	Explain about Fullering	Remember	2
19	Define fillet welds	Remember	2
20	Why connected rod bolts are tightened with initial tension greater that external load	Remember	2
Part - B (Long Answer Questions)			
1	Determine the size of the rivets required for the bracket shown in Fig.Take the permissible shear stress for the rivet material as 100MPa. 	Evaluate	2
2	a. Sketch any three basic types of welded joints. b. Figure shows an eccentrically loaded welded joint. Determine the fillet veld size. Allowable shear stress in the weld is 80 MPa. 	Apply	2

3	a. Differentiate between (i) lap joint and butt joint, and (ii) chain riveting and zig-zag riveting. b. Double riveted lap joint is made between 15mm thick plates. Rivate diameter and pitch are 25mm and 75mm respectively. If UTS are 400 MPa intention 320 MPa in shear & 630 MPa in crushing find minimum force for pitch which will replace the joint. If above joint is subjected to load such that factor of safety is 4 find out actual stresses developed in the plate and rivets.	Understand	2
4	a. What are V threads used for fasteners? b. What are the different series of threads and their applications?	Understand	
5	a. Compare the welded joint with riveted joint? b. Find the size of the weld in Fig. if the permissible shear stress is 80 MPa and the load acting on the connection P=60kN. 	Evaluate	3
6	A cast iron cylinder head is fastened to a cylinder of bore 500mm with 8 stud bolts. The maximum pressure inside the cylinder is 2 MPa. The stiffness of park $k_p=3k_b$. What should be the initial lightening load so that the joint is leakproof at maximum pressure?	Apply	2
7	a. Derive the expression for the maximum stress induced in weld subjected to torsional loading. b. A cylindrical beam is attached to support by weld as shown in Fig. and is subjected to a bending moment M. Find the maximum stress induced in the weld. 	Apply	3
8	Fig. shows a plate bracket welded to a steel column loaded eccentrically. assuming that the size of weld 6 x 6 mm, determine the maximum stress induced in the weld. 	Apply	3
9	a. Differentiate between a stud, a bolt and a nut. b. The cylinder head of a steam engine with 250mm bore is fastened by eight stud bolts made of 30C8 Steel. Maximum pressure inside the cylinder is 1 MPa. Determine the size of bolts and the approximate tightening stress and torque. Take 20% overload. Assume S_y=300 MPa for bolt material.	Understand	2
10	a. What are the different types of the stresses induced in bolts? Explain the procedure of designing a bolt subjected to direct tensile load. b. A bracket is fitted to the channel with 4 bolts. The dimension a=b=150mm distance of load from the C.G of the bolt arrangement is 300mm. Find the diameter of the bolts.	Understand	3
Part - C (Problem Solving and Critical Thinking Questions)			

1	A bracket is fitted to a vertical channel with 5 bolts, three at the top arid two at the bottom with all the bolts equally spaced. The value of P=20 kN, e=200mm, l_1=50mm and l_2=250mm. Find the diameter of the bolt.	Understand	2
2	a. What is meant by a bolt of uniform strength? b. A steam engine cylinder of 300mm effective diameter is subjected to a steam pressure of 1.5 N/mm^2. The cylinder head is connected by means of 8 bolts having yield strength of 320 MPa, and endurance limit of 240 MPa. The bolts are tightened with an initial preload of 1.5 times that of steam load. A soft copper gasket is used to make the joint leak proof. Assuming a fatigue stress concentration factor of 1.4, and factor of safety of 2; determine the size of the bolts required.	Evaluate	2
UNIT-III KEYS, COTTERS AND KNUCKLE JOINTS			
Part - A (Short Answer Questions)			
1	Define what is a key where it is used	Remember	3
2	Explain saddle key	Understand	3
3	Explain sunk key	Understand	3
4	Explain flat key	Understand	3
5	Explain feather key	Understand	3
6	Explain Kennedy key	Understand	3
7	Explain the effect of key way on strength of shaft	Remember	3
8	Explain what do u mean by cotter	Remember	3
9	Which material is generally used for cotter	Understand	3
10	Why taper is given to the cotter	Remember	3
11	Explain the purpose of Gib in cotter joint	Understand	3
12	Write the applications of cotter joints	Understand	3
13	Explain how slipping of cotter is avoided	Remember	3
14	Explain types of stresses are introduced in a key	Understand	3
15	Write the advantages of key	Remember	3
16	Write the demerits of key	Remember	3
17	Explain round key	Remember	3
18	Write the applications of key	Remember	3
19	Explain Gibhead key	Remember	3
20	Explain about woodruff key	Remember	3
Part – B (Long Answer Questions)			
1	Design a spigot and socket joint to connect two rods of 30 C8 steel to carry an axial tensile and compressive load of 10 kN. 	Analyze	1
2	Design a knuckle joint to connect two tension rods subjected to an axial load of 15 kN. Use 30C8 steel material for all the components. The four components of a joint are (i) double eye end, (ii) single eye end, (iii) pin and (iv) split pin.	Apply	1

3	a. Classify the keys and state their applications. b. Figure shows the dimensions of a woodruff key. The key is mounted on a 30mm diameter shaft, transmitting 5kW power at 240 r.p.m. the yield strength in shear for the key material is 280 MPa, and in crushing, 460 MPa. Calculate the factor of safety used in the design, considering both crushing, and shearing of the key.  	Understand	2
4	a. Where and why the woodruff key is used? b. A 30 kW power is transmitted at 240 r.p.m, from 40 mm diameter shaft, by means of two kennedy keys of 12 x 12 mm cross-section. Determine the length of the keys. For the keys, take permissible shear stress as 60 MPa, and crushing stress as 90 MPa.	Analysis	3
5	Design a cotter joint to connect two mild steel rods for a pull of 30 kN. The maximum permissible stresses are 55 MPa in tension; 40 MPa in shear and 70 MPa in crushing. Draw a neat sketch of the joint designed.	Remember	3
6	Two rod ends of a pump are joined by means of a cotter and spigot and socket at the ends. Design the joint for an axial load of 100 KN which alternately changes from tensile to compressive. The allowable stresses for the material used are 50 MPa in tension, 40 MPa in shear and 100 MPa in crushing.	Apply	1
7	Design a cotter joint to connect a piston rod to the crosshead. The maximum steam pressure on the piston rod is 35 KN. Assuming that all the parts are made of the same material having the following permissible stresses: $^{\sigma}_{1}$=50 MPa; τ = 60 MPa and σ_c=90 MPa	Apply	1
8	Design a knuckle joint to connect two mild steel bars under a tensile load of 25 kN. The allowable stresses are 65 MPa in tension, 50 MPa in shear and 83 MPa in crushing.	Apply	1
9	A knuckle joint is required to withstand a tensile load of 25 kN. Design the joint if the permissible stresses are: $^{\sigma}_{1}$=56 MPa; τ = 40 MPa and σ_c=70 MPa	Apply	1
10	A gear is mounted centrally on a shaft of 0.25m length, between the supports. The pitch circle diameter of the gear is 0.15m. The gear transmits 10kW power at 240 r.p.m. assuming suitable stresses for the materials, determine i. shaft diameter, ii. Key dimensions and iii. Minimum width of the gear.	Analysis	3
UNIT-IV DESIGN OF SHAFTS AND SHAFTS COUPLINGS			
Part – A (Short Answer Questions)			
1	Define shaft	Remember	4
2	Write the application of shafts	Remember	4
3	Explain the materials used for making shafts	Remember	4
4	Define hollow shaft s	Remember	4
5	Define equivalent bending moment	Remember	4
6	Define equivalent twisting moment	Remember	4
7	Define coupling	Remember	4
8	Explain classification coupling	Remember	4
9	Explain functions of coupling	Remember	4
10	Write the applications of coupling	Remember	4
11	Explain about universal coupling	Remember	4

12	Explain about bushed pin flexible coupling	Remember	4
13	Write merits and demerits bushed pin flexible coupling	Apply	4
14	Define clutch	Apply	4
15	Define rigid coupling	Apply	4
16	Write the difference between shaft and axle	Apply	4
17	Define torsional rigidity	Apply	4
18	Define lateral rigidity	Apply	4
19	Explain causes for failure of shaft	Apply	4
20	Define transmission types of shafts	Analyze	4
Part – B (Long Answer Questions)			
1	For the shaft shown in Fig. the ratio of belt tension for either belt is 3:1. The maximum tension in the belt is 3000 N. S_{ut} = 650 MPa, S_y = 400 MPa for the shaft material. K_m = 1.5, K_t = 1.2. Determine the shaft diameter and angle of twist when the pulleys are keyed to the shaft.	Apply	3,4
2	A 600 mm diameter pulley driven by a horizontal belt transmits power to a 200 mm diameter pinion. The pulley has a mass of 90 kg, K_m = 2, K_t = 1.5 and $\tau = 40$ MPa. Find the diameter of the shaft.	Analyze	3,4
3	Design a line shaft transmitting power to two machine tools. The power received by the shaft is 30 kW at 300 r.p.m. The power absorbed by pulley P_1 is 12 kW and the remaining power is absorbed by pulley P_2. The diameter of pulley P_1 is 300 mm and its mass is 40 kg. The diameter and mass of pulley P_2 are 600 mm and 75 kg respectively. Assume the belt tension ratio of 2 for both pulleys and the shaft material is 30C8 steel with K_m = 2 and K_t = 1.5. Draw the b.m and torque diagrams, assuming maximum shear stress theory. 	Analyze	4
4	Design a rigid muff coupling. Use C.I for the muff. The power transmitted is 25kW at 300 r.p.m. S_{ut} = 200 MPa, F.S = 6, use 30C8 steel for the shaft consider S_y = 330 MPa and F.S = 4. 	Apply	4
5	For the connection of above shafts if the protected type of flange coupling is used, find the dimensions of flanges and bolts.	Apply	4
6	Design a bushed pin type of flexible coupling to connect the motor shaft and pump shaft of 50 mm and 40 mm diameter respectively when 15kW power is to be transmitted at 1200 r.p.m, the permissible bearing pressure for pin is 0.3 MPa.	Understand	4

7	Design a split muff coupling to transmit a power of 25 kW at 300 r.p.m. Use the same materials as in example 	Apply	4
8	A shaft is subjected to loads as shown in Fig. Gear *C* is connected to the other gear such that 50 kW is transmitted at 100 r.p.m. The pressure angle of the involute gear teeth is 20^0. The ratio of belt tensions for pulley *A* is 2:1, the diameter of pulley being 750 mm. the sprocket *B* is 500 mm diameter with negligible tension in the chain on the slack side. The diameter of gear *C* is 300mm. The power transmitted by chain drive is 20 kW, the remaining being transmitted by the belt drive. Find diameter of the shaft if F.S=3, K_m = 1.5, K_t = 1.2 and S_y = 350 MPa for shaft material. 	Analyze	4
9	Calculate the diameter of the solid circular shaft shown in Fig. to transmit 45 KW at 1000 rpm the pressure angle of the involute bevel and spur gears is 20^0. Diameter of bevel gear *C*=500mm and the diameter of spur pinion *D*=300mm. Assume complete power being transmitted and safe shear stress for shaft equal to 60 MPa.	Apply	4
10	An electric motor drives a machine through a pair of spur gears. The pinion is mounted on motor shaft and overhangs by 200 mm from the nearest bearing. The pinion has 20 teeth of 10 mm module and 20^0 involute profile. Design the motor shaft to transmit 15 kW at 1200 rpm. Use safe shear stress value of 400 MPa, K_m = 1.2 and K_t =1.	Apply	4
Part - C (Problem Solving and Critical Thinking Questions)			
1	A shaft subjected to a b.m due to the weight of the pulley equal to 2000N and a non-rotating load of 800 N acting vertically downwards rotates at a speed of 1400 r.p.m. The distance between the bearings is 1 m. The external load and the load due to pulley act at a distance of 300 mm from L.H. bearing. The material of the shaft has S_y = 300 MPa and S_e = 200 MPa. Using F.S = 2.5, find the diameter of the shaft if K_t due to keyway is 1.3. 	Apply	4
UNIT-V MECHANICAL SPRINGS			
Part - A (Short Answer Questions)			
1	Define spring	Evaluate	5
2	Explain functions of spring	Remember	5

3	Explain why the circular cross section used mostly for spring	Remember	5
4	Define flat springs	Remember	5
5	Define spiral springs	Remember	5
6	Define helical springs	Understand	5
7	Define spring index	Remember	5
8	Define free length	Remember	5
9	Define solid length	Understand	5
10	Define active number coils	Remember	5
11	Define the phenomenon of surging in springs	Remember	5
12	Explain about ground ends	Understand	5
13	Explain about square ends	Remember	5
14	Define methods to avoid surge in springs	Understand	5
15	Define leaf springs	Remember	5
16	Explain why leaf springs are made in layers instead of single plate	Remember	5
17	Define helical torsion spring	Remember	5
18	Explain spiral torsion spring	Remember	5
19	Define Wahls factor	Remember	5
20	Define spring rate	Remember	5
Part - B (Long Answer Questions)			
1	A railway wagon of mass 20000 kg moving with a velocity of 2 m/s is brought to rest by two buffers of a spring of diameter 300 mm. The maximum deflection of the spring is 200 mm. permissible shear stress is 600 MPa. Find the dimensions of each spring.	Understand	5
2	Design a close coiled helical spring subjected to a tensile load of magnitude varying from 2500 N to 3000 N. The axial deflection of spring for this range of load is 6.5 mm. Design the spring, talking the spring index as 6 and the safe shear stress for material of the spring equal to 465 MPa.	Apply	5
3	A load of 5 kN is dropped from a height of 50 mm axially on the spring of a wire of diameter 12 mm, spring index equal to 6 and the number of active coils as 8. Find the stress induced in the spring	Analyze	5
4	A helical spring is subjected to a continuously varying load. A number 7 oil tempered wire is used with the mean diameter of the coil as 26 mm. The maximum and minimum force acting on the spring is 400 N and 260 N respectively and deflection during this variation is 8mm. Find the factor of safety and number of active turns. For No. 7 wire oil tempered S_u = 1400 MPa, S_{ys} =0.4 S_u, S_{es}=0.23S_u and d=4.5mm.	Analysis	5
5	A helical compression spring carries a fluctuating load varying from 428 N to 642 N. The spring index is 6 and factor of safety is 1.5. S_{ys} = 648 MPa, S_{es} = 375 MPa. Calculate the spring wire diameter and the number of effective turns if deflection due to variation in load is 4mm.	Apply	5
6	Design the cantilever leaf spring to absorb 600 N.m energy without exceeding a deflection of 150 mm and permissible stress of 800 MPa. The effective length of the spring is 500 mm. E=0.2 x 10^6 MPa	Apply	5
7	A Close coiled helical compression spring is used in the spring loaded safety valve of 80mm diameter. The blow off pressure is 1.4 MPa and maximum lift is 18 mm. Material of the spring is oil quenched steel with a safe shear stress of 500 MPa. Spring index is 6. The normal pressure inside the boiler is 1.00 MPa and G=0.84 x 10^5 MPa. Design the spring	Apply	5
8	Design a tension spring for a spring balance when the maximum load to be weighed is 1000N. Length of the scale is 100mm and the spring index is 5. The material has the maximum permissible shear stress of 600 MPa and G=0.8 x 10^5 MPa.	Apply	5

9	The blow off pressure for a safety valve is 1.2 MPa with the maximum lift of the valve as 10 mm. The valve of diameter 69 mm is loaded with a spring of spring index 5.5 and an initial compression of 40 mm. Maximum permissible shear stress for the spring material is 500 MPa, G=0.8 x 10^5 MPa. Design the spring	Evaluate	5
10	A helical compression spring is subjected to a load varying between 800 and 1500 N. The material used is oil tempered cold drawn wire having S_{ys} = 700 MPa and S_{es} = 356 MPa. Find the diameter of the wire and the number of coils if *C*=5 and *N*=2.5	Apply	5
11	A close coiled helical compression spring has a mean coil diameter of 60 mm and the diameter of the wire is 10mm. Number of active and inactive coil turns is 11 and 2 respectively. Free length of the spring is 210mm. Decide the maximum load that can be applied on the spring if the minimum load is one third of the maximum load. Use F.S = 1.5, S_{ys} =700 MPa and S_{es} = 1360 MPa.	Evaluate	3

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