MARIA COLLEGE OF ENGINEERING& TECHNOLOGY
ATTOOR

TWO MARKS QUESTIONS
UNIT.1
DESIGN OF MACHINE ELEMENT

1. Define design.
2. What are the various phases of design process?
3. List some factors that influence machine design.
4. Define optimization?
5. What are the various optimization methods available?
6. Describe material properties hardness, stiffness and resilience.
7. What is an impact load? Give examples.
8. Define principal plane and principal stresses?
9. Define factor of safety?
10. What are the factors to be considered in the selection of material for a machine element?
11. Why normal stress theory is not suitable for ductile materials?
12. State the various methods of finding stresses concentration factors?
13. State the various methods of finding stresses concentration factors?
14. What are the factors that affect notch sensitivity?
15. What are the types of variable stresses?
16. What are the various theories of failure?
17. Explain size factor in endurance strength?
18. What are the methods used to improve fatigue strength?
19. What is an S-N curve?
20. What is low and high cycle fatigue?

UNIT. 2

1. What is a shaft?
2. What are the types of shaft?
3. What are the types of rigidity?
4. Why a hollow shaft has greater strength and stiffness than solid shaft of equal weight?
5. Why is maximum shear stress theory used for shaft?
6. What is the significance of slenderness ratio in shaft design?
7. Define the term critical speed?
8. What is a key?
9. What are the types of key?
10. What is the main use of woodruff keys?
11. What types of stress are developed in the key?
12. Classify crankshafts.
13. What are functions of crankshafts?
14. What are the materials used for crankshafts?
15. What is coupling?

16. What is the function of a coupling between two shafts?
17. Under what circumstances flexible couplings are used?
18. Where are flexible couplings used?
19. What is the material used for flange or flange coupling?
20. What is the advantage of gear coupling?

UNIT.3

1. What are the purposes of screws?
2. What is a stud?
3. How is bolt designated?
4. How is a bolt designated? Give example
5. What is the meaning of bolt M24×2?
6. State the advantages of threaded joints?
7. Define the term self locking of power screws?
8. Define welding?
9. Why are welded joints preferred over riveted joints?
10. How is welding classified?
11. What are the types of welded joints?
12. Define butt and lap joint?
13. Define Tee joint and corner joint?
14. When will the edge preparation need?
15. What is the minimum size for fillet weld?
16. When will the weld deposit be weaker?
17. What is a rivet?
18. What are the different working processes used for making riveting?
19. Name the possible modes of failure of riveting joint.
20. Define circumferential joint.

UNIT.4

1. What is a spring?
2. What are the applications of spring
3. State any two function of springs
4. What are the various types of springs?
5. Classify the springs.
6. How will you find whether the given helical spring is a compression spring or tension spring?
7. What are conical springs?
8. What is spring index?
9. What are active coils?
10. What are the end conditions of the spring?
11. What is fly wheel?
12. What is the function of the fly wheel?
13. What is the application of flywheel?
14. State any two type of flywheel.
15. What is flywheel effect?
16. Define coefficient of fluctuation of speed in the case of flywheel?

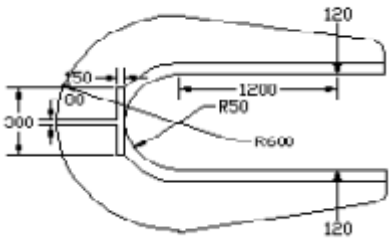
17. Define the term fluctuation of energy.
18. State the type of stresses induced in a rim flywheel?
19. What are the stresses induced in flywheels arms?
20. How does the function of flywheel differ fro that of governor?

UNIT.5

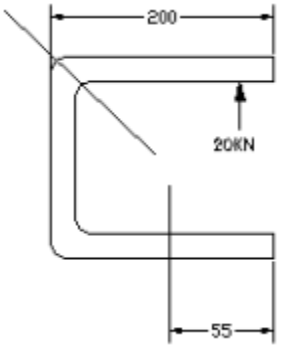
1. What is bearing?
2. State the components of rolling contact bearings?
3. Classify the roller bearings?
4. List any four advantages to rolling contact bearings over sliding contact bearings?
5. State the advantages of thrust ball bearing?
6. what is load rating
7. Explain the term Dynamic load carrying capacities of rolling contact bearing?
8. List any six types of bearing materials?
9. What is the advantage of Teflon which is used for bearings?
10. What is journal bearing?
11. What are types of journal bearings depending upon the nature of contact?
12. What are the types of journal bearing depending upon the nature of lubrication?
13. What is known as self acting bearing?
14. What are seals? What are the main types of seals?
15. How is "O" ring designated?
16. What is a connecting rod?
17. What are materials used for connecting rod?
18. What are the stresses set up in an IC engine connecting rod?
19. What type of external forces act on connecting rod?
20. Why I- section is chosen for the connecting rod?

BIG QUESTIONS

1. A bar of circular cross section is subject to alternating tensile forces varying from 200kN to 500kN. Material's ultimate tensile strength is 900Mpa,endurance limit is 700Mpa. Determine the diameter of the bar using safety factors of 3.5 related to ultimate strength and 4 related to ultimate strength and 4 related to endurance limit. Stress concentration factor us 1.65 use Goodmancriteria**.**
2. A steel bar is subjected to a reversed axial load of 180kN. Find the diameter of the bar for a design factor of 2. Ultimate tensile strength 1070N/mm^2 yield strength 910N/mm^2 . Endurance limit in bending is half of ultimate tensile strength. Use the following data. Load factor 0.7, Surface finish factor 0.8, Size factor 0.85, and stress concentration factor 1.
3. A Punch frame has shape and loading as shown. Determine the stress developed.



4. A C Clamp is acted upon by a load of 20kN as shown in figure. The clamp has a square cross section throughout the length And is made of a materials with an allowable tensile stress of 150Mpa. Determine the side of the square cross section. Determine the stress developed at section BB.



5. A steel cantilever bean 180mm long has a diameter ‘d’ for a length of 125mm from the free end and ‘2d’ for the remaining length. A fillet of radius 0.2d is provided at the junction of the two sections. A transverse load varying from 4N up and 135N down is acting in combination with an axial load that varies from-110N to + 450N . Using a design factor of 2, calculate the diameter at the fillet section for infinite life. Ultimate strength 550Mpa, yield strength 470Mpa, Endurance limit 275Mpa. Size factor 0.85 surface factor 0.9 stress concentration factor for bending 1.44, for axial load 1.63 .

UNIT 2

1. A hollow steel shaft of 800mm outside diameter is used to drive a propeller of a marine vessel. The shaft is mounted on bearings 6m apart, and it transmits 6000kW at 200rpm. The maximum axial thrust is 750kN and shaft weighs 75 kN.
   Determine
   A) Maximum shear stress induced
   B) Angular twist of shaft between bearings.
2. A shaft is to transmit power from an electric motor to a machine through a pulley by means of a vertical belt drive with unit speed ratio. The pulley weighs 500N and is overhanging at a distance of 150mm, from the bearing.Diameter of pulley is 300mm maximum power transmitted at 250rpm is 4.5kW. Co-efficient of friction between the

belt and the pulley is 0.3 combined shock and fatigue factor in torsion is 1.5 and in bending is 2.0, permissible shear Stress for the shaft material is 45N/Sq. mm. Design the shaft.

3.)A Shaft is subjected to reversal bending moment of 80Nm and variable torque that varies from + 10Nm to 50Nm during each cycle. Assuming that the shaft is made of C-40 steel. For a design factor of 2, determine the required diameter of shaft.

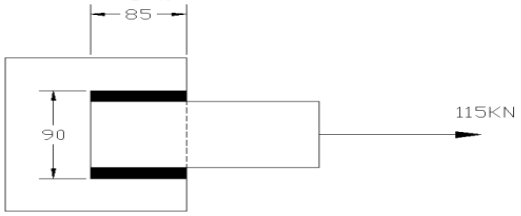
4). A shaft 30mm diameter is transmitting power at a maximum shear stress of $80N/mm^2$. If a pulley is connected to the shaft by means of key, find the dimension of the key so that the stress in the key is not to exceed 50N/mm 2 and the length of key is 4 times of width the key.

5. Design a muff coupling to connect two shafts transmitting 40kW at 150rpm. The allowable shear and crushing stresses for the shaft and key are $37N/mm^2$ and $96.25N/mm^2$ respectively. The permissible shear stress for the muff is $17.5N/mm^2$. Assume that the maximum torque transmitted is 20% more than the mean torque. Take the width and depth of the parallel key is 22mm and 14mm respectively.

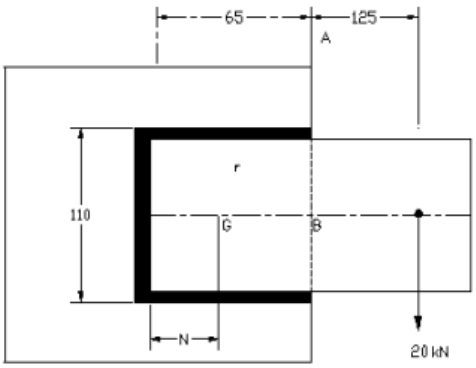
Unit.3

1. A bolted joint is used to connect two components. The combined stiffness of the two components is twice the bolt stiffness. Initial tightening load tightening load is 5kN. The external force of 10kN creates further tension in the bolt.The bolt is made of plain carbon steel 30C8 for Which yield strength in tension is 400N/mm 2 . Using a factor of safety of safety of 3 and assuming coarse threads, select a suitable bolt size.

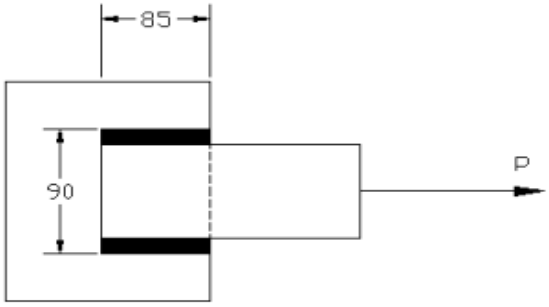
2. Find the size of the weld for the conversion shown in figure. If the tensile load acting on the connection is115kN. Assume permissible shear stress n the weld is 90kpa. A bracket shown in figure carries a load of 120kN. Calculate the size of the weld, if the allowable stress is not to exceed 70N/mm 2



3. A rectangular steel plate 100mm wide is welded to a vertical plate to form a cantilever with an overlap of 50mm and an overhang of 150mm. It carries a vertical downward load of 60kN at free end. Fillet weld is done three sides of the plate for a permissible stress is 140N/mm 2 . Determine the size of the weld.
4. An eccentrically loaded plate is welded to a frame as shown in fig. 3.85. Design the welded joint. If the tensile stress in the plate should not exceed 140N/mm 2 and that in weld is $70N/mm^2$.



5. Fig shows a welded connection subjected to a force the member is 10mm thick hot rolled steel and welded to the support using two 6mm parallel fillet weld. Estimate the safe force F for a factor safety of 2.8. Assume permissible stress to be 55Mpa.



Unit 4

1. Design a helical compression spring for a load range of 2.0 to 2.5kN and deflection for this range being 5.0mm. Spring index is Modulus of rigidity is 84kN/mm ^{2}. permissible shear stress is 400N/mm ^{2}.
2. A helical spring is made from a wire of 6mm diameter and is of outside diameter 70mm. The spring has 6 numbers of active coils. If the permissible stress in shear is 300N/mm 2 and the modulus of rigidity is 80kN/mm ^{2} . Find the axial load which the spring can take and the deflection produced.
3. Two close coiled helical springs are arranged concentrically one inside the other. Both spring have the same number of effective coils and same overall length, but the mean coil diameter of the outer spring is two and half times of the inner spring, which is made of bronze. The outer spring is made of steel. The springs are designed to act together when a force is applied, so that both suffer change in length and each carries twice the force. Determine ratio 0f the wire diameters and the ratio of stresses induced in wires, if the modulus of rigidity 3 of steel is twice that of bronze.
4. A torsion spring is wound from a round wire into coil mean diameter 40mm. The torsion moment applied on the spring is 6N-m. Assume the spring index as 8. The Permissible stress in the spring in the spring is 530N/mm 2 and E= 2.6 * 10 5

N/mm 2. What must be the diameter of wire and the corresponding deflection in degrees? Take number of effective coils as 9.

5. A semi elliptic leaf spring consists of two extra full-length leaves and seven graduated length leaves, including the master leaf. Each leaf is 7mm thick and 58mm wide. The centre-to-centre distance between the two eyes is 1.2m. The leaves are pre-stressed in such a way that when the load is maximum, stress induced in all leaves are equal to 370N/mm ^{2} .Determine the maximum force that the spring can withstand.

Unit 5

1. A 25BC02 deep groove ball bearing is to operate at 1300rpm and carries 6000N radial load and 4500N thrust load. The bearing is subjected to a light shock load. Determine the rating life of the bearing.

2. Select a bearing for a 45mm diameter shaft rotates at 500rpm. Due to a bevel gear mounted on the shaft, the bearing will have to withstand a 4500N radial load and a 2500N thrust load. The life of the bearing expected to be least 6000hr

3. Design journal bearing for 20MW, 200rpm stem turbine, which is supported by two bearings. Take the atmosp0heric temperature as 23 0 C and operating temperature of oil is 70 0 C. Assume viscosity of oil as 20 centistokes.

4. An internal combustion engine develops 60Kw at 250rpm with explosions per minute. The done during power stroke is 1.5 times the work done during one cycle. If the revolution of speed is to be limited within 0.6% of the mean speed, design suitable cast iron flywheel. Select suitable materials and specify stress value.

5. Design a cast iron flywheel for a four-stroke engine to develop 150 kW brake power at 200rpm. The work done during the power stroke is 1.4 times the average work done during the whole cycle. The mean diameter of the flywheel may be taken as 2.5 meter. The total fluctuation of speed is to be speed is to be limited to 5% of the mean.