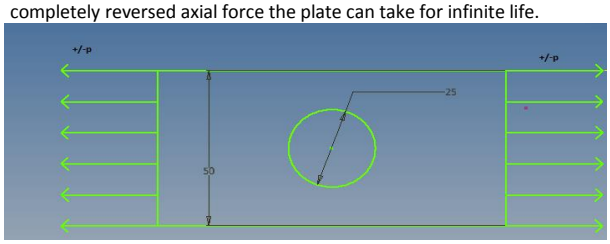
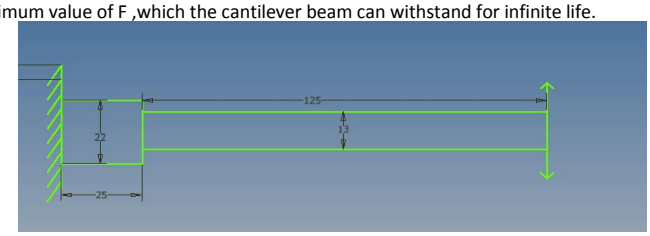
GOVERNMENT ENGINEERING COLLEGE BHUJ
MD-I (5TH SEM)
ASSIGNMENT

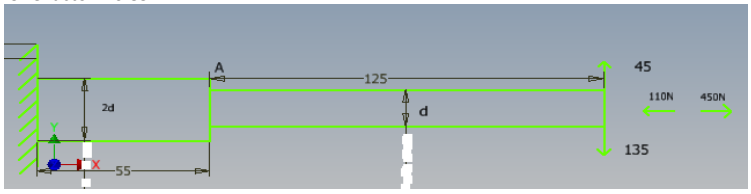
1 What is contact stress? Explain with suitable examples
2 What is standardization? Explain its significance.
3 S-N diagram and endurance limit
4 What is the stress concentration ?
5 What is the difference between the endurance strength and the endurance limit?
Explain the use of following diagrams in the design of the component subjected to different values of fluctuating stresses i) Soderberg diagram ii) Gerber parabola iii) Goodman diagram Iv) Modified goodman diagram why modified Goodman diagram in widely accepted?
6 A plate made of plain carbon steel 20c8 (Sut= 440N/mm2) is shown in fig. The theoretical stress concentration factor and notch sensitivity are 2.50 and 0.80 respectively . The surface finish factor ,size factor and reliability factor and reliability factor are 0.67,0.85 and 0.897 respectively. The plate thickness is 30mm .If the required factor of safety is 2.0, determine completely reversed axial force the plate can take for infinite life.



7 A cantilever beam made of cold drawn steel 35C8(Sut =550 N/mm2) and (Syt =320 N/mm2), shown in fig , is subjected to a load which varies from – F to 3F. The surface finish factor and size factor are 0.89 and 0.85 respectively. The theoretical stress concentration factor and notch sensitivity at the fillet are1.42 and 0.9 respectively. If the factor of safety is 2, determine the maximum value of F ,which the cantilever beam can withstand for infinite life.



8 A steel cantilever beam, shown in fig, is subjected to a transverse loading at its end that varies form 45N up to 135N down and axial load that varies from 110N(compressive) to 450N (tensile). Determine the required diameter at the change of cross-section for infinite life using a factor of safety of 2.
Assume the following data:
Yield strength in tension and compression = 470 N/mm2
Ultimate tensile strength = 550N/mm2
Theoretical stress concentration factor = 1.63
Notch sensitivity = 0.8
Load factor = 0.923
Surface finish factor =0.9
Size factor = 0.85



9 What are the advantages of using Belleville springs?
10 Explain the terms
1) Spring rate 2) Free length 3) Solid length
4) Spring index 5) wahl stress factor 6) Active & Inactive coils

11 Design a helical compression for a spring operated pressure relief valve with following data :
> Operating pressure = 1.25 N/mm2
> Valve lift = 3.5 mm at 10% pressure rise over operating pressure
> ddDiameter of valve = 25 mm
> Limiting mean coil diameter = 40 mm
> Premissible shear stress for spring = 500N/mm2
> Modulus of rigidity for spring material = 834 Pa
> The available standard spring wire diameters are : 2, 3, 4, 5, 6, 7, 8, and 10 mm.

12 A locomotive spring has an overall length of 1.2 m and sustains a load of 72 kN at its centre. The spring has 3 extra full length leaves and 15 graduated leaves with a central band 100 mm wide. All leaves are to be stressed to 420 N/mm2 , when fully loaded. The ratio of total spring depth to width is to be approximately 2. If the modulus of elasticity for spring is 2.1×10^5 N/mm2 Determine:
(i) the width and thickness of the leaves; and
(ii) the initial space that should be provided between the full length and graduated leaves before the band load is applied.
What load is exerted on the band after the spring is assembled ?

13 State the advantages and limitations of belt drives.

14 What is creep in belt?

15 Example: An open type flat belt drive is used to transmit 5kW power from an electric motor running at 1500r.p.m to the compressor running at 600r.p.m. The diameter of motor pulley is 140mm and the centre distance between the two pulley shafts is 1000mm. The allowable stress for the belt material is 1.7N/mm2 and the coefficient of friction between the belt and pulley is 0.3. The slip at the operating conditions 2%.If the thickness of the belt is 10mm, find:
I) the diameter of compressor pulley; and
ii) the width of belt.
Neglect the effect of centrifugal tension.

16 A pulley of 1000mm diameter is driven by an open flat belt from a 25kW, 1440r.p.m. electric motor. The pulley on the motor shaft is 250mm in diameter and the centre distance between the two shafts is 2.0m. The allowable tensile stress for the belt material is 2N/mm2 and the coefficient of friction between the belt and pulley is 0.28. The density of the belt material is kg/m3 . If the width of the belt is 125mm, determine:
I) the thickness of belt; II) the length of belt; and
III) the initial tension required in the belt.

17 A cast iron pulley of 900mm diameter is to be used for transmitting 7.5kW power at 200 r.p.m. to a shaft of 35mm diameter. The ratio of the belt tensions is 2:1, while the permissible tension in belt is 20 N per mm width. If the permissible tensile stress for the pulley is 15N/mm2 , design the pulley.
(i) Deteremine the width of the belt, and
(ii) Design the pulley.

18 A simple chain ANSI 25 is used to transmit power from a single cylinder design engine running at 1600 r.p.m. to the mixer running at 400 r.p.m. The number of teeth on driving sprocket is 20. The service condition is heavy shock .calculate:
I) The rated power for which the chain can be used:
II) The tension in the chain for rated power ;and
III) The factor of safety for chain based on breaking strength.

19 A rope drive is used to transmit 260kW from a 300mm pitch diameter pulley rotating at 1000 r.p.m to a 600mmm pitch diameter pulley. The groove angle is 45 degree and centre distance is 6m. The mass of rope is 1.3kg per meter and the coefficient of friction between the rope and pulley is 0.3. If the permissible pull for each rope is 2200N, determine the number of rope required.

20 Sketch the following types of bearings and state the conditions under which they are used :
(i) Single-row deep-groove ball bearing,
(ii) Anguler-contant bearing,
(iii) Self-aligning bearing,
(iv) Cylindrical roller bearing,
(v) Taper roller bearing.

21 Define the following terms :
(i) Basic static capacity,
(ii) Basic dynamic capacity,
(iii) Rating life,
(iv) Median life.

22 Compare mineral oil with grease as a lubricant for rolling contact bearings.

23 State and explain the types of failures in rolling contact bearings.

24 :- A deep-groove ball bearing having bore diameter of 60mm and rotating at 1440 r.p.m. is subjected to a radial force of 2500N and an axial of 1200N. The radial and thrust factors are 0.56 and 2.0 respectively. The load factor is 1.2 . If the expected rating life is

25,000 hours, calculate the required basic dynamic capacity of the bearing and select the bearing from manufacturer's catalogue

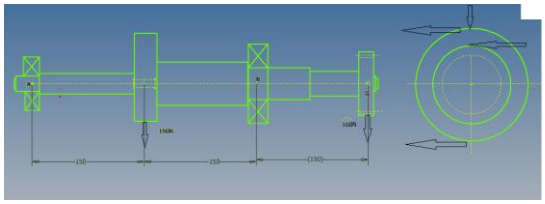
25 30 hp. 1440 r.p.m. electric motor is directly coupled to a shaft of 25mm diameter. Which is supported by two cylindrical roller bearings. The shaft transmits power to another line shaft through the flat pulley of 300mm diameter which is placed mid-way between the two bearings. The coefficient of friction between the belt and pulley is 0.3, while angle of lap is 180°. The belt is horizontal. The load factor is 1.5. If the expected life of bearing is 50,000 hours, select the bearing from manufacturer's catalogue. Use the following data:

Bearing no		NU2205		Nu 2305	
Basic dynamic "C"KN		15.99		31.39	

26 The overhung countershaft, shown in fig. is supported at A and B by two single-row deep-grove ball bearing. The shaft diameters at A and B are 17mm and 35mm respectively. The shaft receives 7.5 kW power at 1000 r.p.m. trough a flat belt pulley 'P" and transmits power to the machine through spur gear 'G'. The load factor is 1.5. If the expected rating life is 40,000 hours, select the bearings from manufacturer's catalogue using the following data:

Diameter of pulley P =250mm
Pitch circle diameter of spur gear G = 150mm
Ratio of belt tensions =2.0
Angle of lap for belt =180
Weight of spure gear G = 100N
Weitht of pulley P = 150KN
Gear pressure angle = 20

Bearing No.	6003	6203	6303	6403	6007	6207	6307	6407
Basic dynamic capacity 'C' kN	6.05	9.56	13.5	22.9	15.9	25.5	33.2	55.3



27 A ball bearing operates on a work cycle consisting of three parts : a radial load of 3000 N at 720r.p.m. for 30% of the cycle, a radial load of 7000N at 1440r.p.m. for 40% of the cycle, and a radial load of 5000N at 900r.p.m. for the remaining part of the cycle. The basic dynamic capacity of the bearing is 30700N. Calculate:
(i) The rating life of bearing in hours;
(ii) The average spped of rotation; and
(iii) The life of bearing with 95% reliability.