Dronacharya College Of Engineering
Question Bank (Semester-VI)

Subject :- MMD-II

Section 1.

Theortical Questions :-

1. What do you understand by Erogonomic and value engineering considerations in design?
    a . Explain the Role of Processing in design ?
    b.What is the design considerations for casting?
2. What is 'Adaptive design '? Where is it used? Give examples.
3. What are the various phase of design process?
4. List some factors that influence machine design.
5. Define: "Optimization"
6. Define Principal plane, principal stress
7. Give examples for curved beams
8. Why normal stress theory is not suitable for ductile materials?
9. Define stress concentration and stress concentration factor. ,
10 Define: "Factor of safety"
11. How is factor of safety defined for brittle and ductile materials?
12. What are the various factors to be considered in deciding the factor of safety?
13. What are the factors to be considered in the selection of materials for a machine element?
14· Differentiate between static and variable stresses.
15. Define amplitude stress and stress ratio. What is the value of stress ratio for a cyclic stress?
16. What are various theories of failure?
17. What is the use of Goodman & Soderberg diagrams?
18. Differentiate between Endurance limit and Endurance strength?
19. Define endurance limit. What are the factors affecting endurance strength?
20. What is an S-N Curve?

Numerical Questions :-

1. (a) A piston of a reciprocating compressor has a diameter of 60mm. The maximum pressure on the piston fall is 1.25MN/m2.Assuming the gudgeon pin passing through the small end of the connecting rod can be safely loaded in shear up to 10MN/m2, Calculate the minimum diameter of the gudgeon pin.
(b) Explain with mathematical expressions.
Maximum principal stress theory and Von-Mises-Henky theory

2. (a) Determine the diameter of the steel bar, which is a ductile in a nature subjected to an axial load of 60KN and torsional moment of 1600N-m.Use the factor of safety 2.5.E=200GPa.

(b) Explain with mathematical expressions.Maximum shear theory and Venant's theory .
3. A steel member is subjected to a 3-D stress system and resulting principal stress are 120N/mm2 tension, 80N/mm2and 40N/mm2 compression. If the proportional limit of the material in simple tension is 280N/mm2 and its poison's ratio is O.3.Determine the factor of safety according to (a) Maximum principal stress theory (b) Maximum principal strain theory (c) Maximum shear stress theory.

4. A bolt is subjected to a tensile load of 25KN and a shear load of 10KN. Determine the diameter of the bolt according to:
(a) Maximum principal stress theory
(b) Maximum principal strain theory
(c)Maximum shear stress theory. Assume factor of safety 2.5, Yield point stress in simple tension 300N/mm2, Poisson's ratio is 0.25.

5. Taking stress concentration in to account find the maximum stress induced when a tensile load of 20KN is applied to (i) A rectangular plate 80mm wide and 12mm thick with a transverse hole of 16mm diameter.(ii)A stepped shaft of diameters 60mm and 30mm width a fillet radius of 6mm.

Section 2.

Theortical Questions :-
1. What is a shaft?
2. Write down the formula for finding equivalent twisting moment.
3· Define the term critical speed.
4. What is a key?
5. What are the types of keys?
6. Differentiate between keys and splines.
7. What is the function of a coupling between two shafts?
8. What are flexible couplings used?
9. What is the material used for flange or flange coupling?
10. Differentiate between a cotter joint and a knuckle joint?
11. What are the various types of springs?
12. Classify the helical springs.
13. Define: Leaf springs.
14. What are conical springs?
15. What is spring index?
16. What are active coils and inactive coils?

Numerical Questions :-

1. A line shaft rotating at 200rpm is to transmit 20KW power. the allowable shear stress for the shaft material is 42N/mm2.If the shaft carries a central load of 900N and is simply supported between bearing 3meters apart determine the diameter of the shaft. The maximum tensile or compressive stress is not to exceed 56N/mm$_2$•

2. An electric generator rotates at 200rpm and receives 300KW from the driving engine. The armature of the generator is 60cm long and located between bearing 120cm center to center. Owing to the combined weight of armature and magnetic pull, the shaft is subjected to 9000kg acting at right angles to the shaft. The ultimate stress for the shaft is 4480kg/cm2 and shear stress is 3920kg/cm2.Find the diameter of the shaft for a factor of safety of 6.

3. A mild steel shaft transmit 23KW to 200rpm.It carries a central load of 900N and is simply supported between the bearing 2.5meters apart. Determine the size of the shaft, if the allowable shear stress is 42MPa and the maximum tensile or compressive stress is not exceed 56MPa. What size of the shaft will be required, if it is subjected to gradually applied load?

4. A shaft to transmit 50KW at 1200rpm.It is also subjected to a bending moment of 275NNm.Allowable shear stress is 60N/mm$_2$.The shaft is not to twist more than 20 in a length of 2m.G=80XI03N/mm$_2$.Design a shaft.

5. A factory line shaft is 4.5m long and is to transmit 75KW at 200rpm.The allowable stress in shear is 45MPa and maximum allowable twist is 10 in a length of 20mm diameter. Determine the required shaft diameter.

6. A helical valve spring is to be designed for an operating load range of 90N to 135N.The deflection of the spring for this load range is 7.5mm.Assuming a spring index of 10, a permissible shear stress of 480N/mm$_2$ and a modulus of rigidity of 0.8Xl 0$_5$ N/mm$_2$for the material, determine the dimensions of the spring.

7. A gas engine valve spring is to have a mean diameter 37.5mm.The maximum load will have to sustain is 450N with a corresponding deflection of 12.5mm.The spring is to be subjected to repeated loading and fatigue must be considered a low working stress of 300N/mm2 will be used. Find the size for the wire and number of coil used. Take rigidity of modulus as 0.8XI0$_5$ N/mm$_2$•

Section 3.

Theortical Questions:-

1. What is a bearing?
2. What are the applications of bearings?
3. What are the various types of bearings?
4. What are the types of thrust ball bearings?

5. Classify the roller bearings.
6. What is load rating?
7. State any points to be considered for selection of bearings.
8. What is bearing?
9. Classify the types of bearings.
10. List any six types of bearing materials.
11. What are the required properties of bearing materials?
12. What is a journal bearing?
Numerical Questions :-

1. Design a journal bearing for a centrifugal pump with the following data:
Diameter of the journal = 150mm
Load on bearing = 40KN
Speed of journal = 900rpm .

2. Design a journal bearing for a centrifugal pump from the following data:
Load on the journal=20000N, Speed of the journal=900rpm,
Type of oil is SAElO, for which the absolute viscosity at 55°C=0.017kg/m-s,
Ambient temperature of oil = 15.5^0C, Maximum bearing pressure for the pump=1.5N/mm^2.
Calculate also mass of the lubricating oil required for artificial cooling, If the rise of temperature, if the rise of temperature of oil be limited to lO^0C heat dissipation coefficient=1232W/$m^2/^0$C .

3. A full journal bearing of 50mm diameter and 100mm long has a bearing pressure of l.4N/mm2• The speed of the journal is 900rpm and the ratio of journal diameter to the diametric clearance is 1000. The bearing is lubricated with oil, whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s. The room temperature is 35^0C.Find,
(1) The amount of artificial cooling required.
(2)The mass of lubricating oil required, if the difference between the outlet and inlet temperature of the oil is 10°C. Take specific heat of oil as 1850J/Kg/^{0}C.

4. A 150mm diameter shaft supporting a load of 10KN has a speed of 1500rpm.The shaft run in whose bearing length is 1.5 times the shaft diameter. If the diametric clearance of bearing is 0.15mm and the absolute viscosity of the oil at the operating temperature is 0.011 Kg/m-s.
Find the power wasted in friction.

Section 4.

1 Explain standard system of gear tooth and advantage and disadvantages of 14.50 and 20 degree involutes system.
2. Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures.
3. Why an I section is usually preferred to round section in case of connecting rods?
4. Differentiate between involute and cycloidal profile of the gears
5 Explain the procedure of designing multi speed gear box.