Fifth Semester B.Tech Degree Examination, Nov/Dec 2015

(2013 scheme)

Branch: Aeronautical Engineering

13.503: MACHINE DESIGN (S)

Time:**3** Hours Max.Marks:100

Instructions*: 1) Answer all questions from Part – A and three full questions from Part – B.*

2) Choosing not more than one question from each Module from Part – B.

PART-A

1. Define: "Optimization"
2. Differentiate between static and variable stresses.
3. Define: "Factor of safety"
4. What are the types of keys?
5. What is the material used for flange or flange coupling?
6. Write down the formula for the strength of single transverse fillet weld.
7. What is nipping of laminated leaf spring? Discuss its role in spring design.
8. What is spring index?
9. What is a spring?
10. Classify the types of bearings.**(10X2=20)**

PART-B

MODULE-I

11.a)A piston of a reciprocating compressor has a diameter of 60mm. The maximum pressure on thepiston fall is 1.25MN/m^2.Assuming the gudgeon pin passing through the small end of the connectingrod can be safely loaded in shear up to 10MN/m^2, Calculate the minimum diameter of the gudgeon pin.

(or)

b) 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/mm^2, Poisson's ratio is 0.25.

MODULE-II

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

(or)

b) .A rigid type coupling is used to connect two shaft transmit 15KW at 200rpm.The shaft, key and bolts are made ofC45 steel and the coupling is of C.I. Design the coupling.

MODULE-III

13.a). 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/mm^2 will be used. Find the size for the wire and number of coil used. Take rigidity of modulus as 0.8XI05 N/mm^2.

(or)

b). A leaf spring for a small trailer is to support a load of 8KN. The spring has 8 graduated leaves and 2 free full length leaves of spring steel of safe stress 380MPa.The over all length

1m and the central band is 80mm wide. Taking ratio of total depth of leaves as 3.Design the spring and also determine the deflection of the spring. Take, E=2.1XI05MPa.

MODULE-IV

14. a) 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.

(OR)

b) 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 = 15.50C, Maximum bearing pressure for the pump=1.5N/mm2.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^{o}C heat dissipation coefficient=1232W/m2/^{o}C.

(4X20=80)