BME-024

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

ΟΟ4ΞΞ   **December, 2017**

BME-024 : MECHANICAL ENGINEERING DESIGN

Time : 3 hours   *Maximum Marks : 70*

Note : *Answer any five questions. All questions carry equal marks. Use of calculator and design handbook is permitted. Assume missing data, if any.*

1. (a)   Briefly describe the system design cycle with the help of a suitable flow diagram.   7

    (b)   Determine the wall thickness of a pressure vessel (spherical) of 1200 mm mean diameter subjected to an internal pressure that fluctuates between 5 N/mm^2 to 10 N/mm^2.

    Take σ_{yp} = 200 MPa, σ_e = 160 MPa, FOS = 2   7

2. (a) A rotating shaft made of C-45 steel with σ_{ut} = 630 N/mm^2 is subjected to a completely referred cycle. Determine the endurance strength of the shaft for a life of 90,000 cycles.   *7*

(b) Define Interchangeability and discuss its importance.   *7*

3. (a) Find the diameter of the copper screwed stays in a boiler. Each stay supports an area equal to a square of 125 mm sides. Pressure of steam in the boiler is 1·25 N/mm^2. Safe tensile stress in the material of stay is 35 N/mm^2.   *10*

(b) Enumerate the advantages offered by the threaded joint.   *4*

4. (a) A single riveted lap joint is to be made of 10 mm plates. Find the diameter of the rivets, their pitch and efficiency of the joint. Take τ_s shear strength = 64 N/mm^2 and σ_{ti} tensile strength = 80 N/mm^2. Design the joint so that its strength to withstand shear of rivets is equal to its strength to withstand tearing of the plate across the line of the rivet bolts.   *7*

(b) Two 20 mm plates are 0·3 mm wide and are joined by butt welds. Determine the load that can be sustained by the joint if the load is applied with moderate shock.   *7*

5. (a) A solid shaft is subjected to a bending moment of 3·46 kN-m and a torsional moment of 11·5 kN-m. The shaft is made of C-45 steel, and the factor of safety is 6. Determine the diameter of the shaft.   *7*

(b) What are the materials used for making shafts ? What are the loads that can come upon a shaft ? Under what conditions does the deflection and twist of a shaft become important ?   *7*

6. An AC motor drives a heavy blower through a V-Belt. The rpm of the motor is 1400 while the blower rotates at 350 rpm. The pitch diameters of driver and driven pulley are 100 mm and 300 mm respectively. The power of electric motor is 8000 W. The blower works continuously for 8 hours. Design the V-belt and suggest the number of V-belts. The centre distance between the pulleys is 200 mm.   *14*

7. (a) What are the advantages and limitations of worm gear drives ?   *4*

(b) A cast steel bevel gear has a module of 2·5 mm and the pitch diameter is 0·6 m. The pitch angle is 30° and teeth are 20° full depth. Determine the permissible endurance load.   *10*

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8. (a) Give the application and classification of rollering bearings. *4*

(b) A journal bearing 0·15 m diameter and 0·225 m long is supporting a load of 9000 N at 1200 rpm. If the radial clearance is 0·075 mm and power loss in the bearing is 1·5 kW due to friction, determine the oil viscosity at the operating temperature. *10*

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