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BME-024

BACHELOR OF TECHNOLOGY IN MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination
December, 2013

BME-024 : MECHANICAL ENGINEERING DESIGN

Time : 3 Hours *Maximum Marks : 70*

Note : *Answer **any five** questions . **All** questions carry **equal** marks. Use of scientific calculator is **permitted**. Design data can be **used**. Assume any missing data.*

1. (a) Enumerate the most commonly used Engineering materials and state at least one important property and one application of each. 7

   (b) What are the assumptions used in simple theory of bending ? 3

   (c) State maximum shearing stress theory and its application. 4

2. (a) What is meant by fatigue strength of a material? How do the size and surface condition of a component and type of load affect such strength. 7

   (b) Write Soderberg equation and state its application. 4

   (c) Explain notch sensitivity index and write its expression. 3

3. (a) A circular section shaft is subjected to a Bending Moment of 100 N-m and a twisting torque of 90 N-m. Assume ultimate strength σ_4 = 450 N/mm^2 and ultimate shearing strength = 225 N/mm^2. Design its shaft diameter using factor of safety = 3. 7

(b) Write important steps for designing screw jack. 7

4. Design and draw a double riveted double strape butt joint for two steel plates 12.5 mm thick are required to carry a tensile load of 500 kN. 14

The ultimate values of strength are as follow :

Plate in tension - 600 MPa

Rivet in shear - 490 MPa

Plate and rivet in crushing - 920 MPa

Use a factor of safety = 4.

5. (a) Describe and show different type of welded joints. How the strength of weld joint is calculated ? In how many ways welding joints may be loaded ? 7

(b) What do you understand by A.M. Wahl's factor. 4

(c) Discuss the materials and practical applications for the various types of springs. 3

6. Design and draw a flange coupling to transmit 15kW at 900 r.p.m. from an electric motor to a compressor. Following permissible stresses may be used. 14

Shear stress for shaft, bolt and key material = 40 MPa. crushing stress for belt and key = 80 MPa shear stress for cast iron = 8 MPa

7. A pair of gear made in medium carbon forged steel is required to transmit 25 kW with pinion moving at 950 rpm and velocity ratio being 2.807. The sum of number of teeth on pinion and gear shall be 99. The gears are to be surface hardened to hardness of 50 RC. Design the pinion and gear assuming that face width is 25 times module of the gear for medium power. Design spur gear, i.e, module, pitch circle diameter, number of teeth, tooth profile, face width. 14

8. (a) What is meant by hydrodynamic bearing ? List the basic assumption used in the theory of hydrodynamic bearing. 4

(b) Draw pressuse distribution curve in a journal bearing with thick film lubrication in axial and along the circumferential direction. 5

(c) Write the application and classification of rolling bearings. 3

(d) Define the life of a ball bearing 2