| BME-024 |

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

01388

Term-End Examination

June, 2014

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 and design data book is permitted. Assume any missing data suitably.*

1. (a) Define 'mechanical property' of an engineering material. Define any five mechanical properties.   7

   (b) Write the importance of Alloy Steel. What are the different Alloying elements and their importance ?   7

2. (a) Differentiate between thin and thick cylinder in pressure vessel applications. Write equation for longitudinal and circumferential stress.   7

   (b) State important assumptions made for derivation of Simple theory of Bending. Show variation of stress distribution for rectangular and T-section (graphically).   7

3. (a) What are the different theories of failure ? Explain any one theory. *7*

(b) A solid circular shaft is subjected to a bending moment of 5 kN-m and a torque of 2 kN-m. The shaft is to be made by carbon steel and yield stress σ_y = 480 MPa and shear yield stress τ_y = 265 MPa. Design shaft diameter. *7*

4. (a) Explain fatigue phenomenon in brief. What are the different factors which affect fatigue behaviour of a material ? *7*

(b) Classify and explain types of fit, and also give one example of each type of fit. *7*

5. (a) Draw the Screw Jack and write important design steps for designing screw jack completely. *10*

(b) Write the name of different types of rivet heads and draw sketches. *4*

6. Design a double riveted lap joint for mild steel plates of thickness 10 mm. Calculate the efficiency of the joint. The permissible stresses are :

σ_t = 90 MPa, τ_s = 75 MPa and σ_c = 150 MPa. *14*

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7. (a) What is Wahl's correction factor ? Write the expression for the same. *2*

(b) How are the ends of helical springs made, so that they can be subjected to axial torque ? *2*

(c) Design and draw a protected type of flange coupling which is used for transmitting 150 kW. The shaft runs at 120 rpm. The key and shaft are to be made of same material for which permissible shearing stress is $60 \, N/mm^2$ and compressive strength is $120 \, N/mm^2$. The steel bolt may be subjected to maximum shearing stress of $26 \, N/mm^2$. (Assuming material of the Hanger is cast iron) *10*

8. (a) Write the design procedure for spur gear. *5*

(b) Define life of a ball bearing. *2*

(c) Make sketches to show the pressure distribution in a journal bearing with thick film lubrication. *2*

(d) Discuss two conditions of uniform pressure and uniform wear in friction clutch. Which condition is assumed in design and why ? *5*

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