| BME-024 |

B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)

Term-End Examination

00623   June, 2018

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) Discuss the applications and advantages of computer graphics in mechanical design.   7

   (b) Enumerate the different theories of failure. Discuss the factors in selection of appropriate theory for the design of mechanical components.   7

2. (a) Describe various types of cyclic loadings on a rotating component. Define endurance strength. Write the expression to calculate the endurance limit of wrought ferrous material.   7

   (b) Determine the extreme diameters of the shaft and hole, if the nominal diameter is 10 mm for transition fit H7/n6. Also calculate the largest diameter.   7

3. (a) Discuss the materials of various types of springs and also discuss their practical applications. *4*

   (b) A gas engine valve spring has a mean diameter 37·5 mm. The maximum load it can sustain is 450 N with a corresponding deflection of 12·5 mm. The spring is to be made of tempered steel. The material is to be subjected to repeated loading, hence fatigue conditions must be considered. Take allowable working stress as $300 \ N/mm^2$. Determine the size for the wire and the number of coils to be used. *10*

4. (a) With the help of neat sketch, describe different types of welded joints. Discuss the method of determining the strength of a welded joint. *7*

   (b) Classify the riveted joints. Discuss the different ways in which rivet joints fail. *7*

5. A pair of gears made in medium carbon forged steel is required to transmit 40 kW with pinion moving at 800 rpm and velocity ratio being 2·5. The sum of number of teeth on pinion and gear shall be 110. 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 transmission. Design spur gear, i.e. module, pitch circle diameter, number of teeth, tooth profile and face width. *14*

6. A machinery shaft is to transmit 61·5 kW at a speed of 1150 rpm with mild shock. The shaft is subjected to a maximum bending moment of 900 N-m and an axial thrust of 70 kN. The shaft is supported at intervals of 2·5 metres. What should be its diameter when designed according to code ?   *14*

7. Design a centrifugal clutch with four shoes for transmitting 20 kW at 1200 rpm. The speed at which engagement begins is 80% of the running speed. The inside radius of pulley rim is 150 mm. The shoes are lined with Ferodo lining for which coefficient of friction (μ) is 0·25.   *14*

8. A 150 mm diameter shaft runs at 1500 rpm, supporting a load of 10 kN. The shaft runs in a bearing of length 1·5 times the shaft diameter. The clearing ratio is 0·015. The absolute viscosity of the oil is 11 cP. At its operating temperature, find the power lost in friction.   *14*