B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)
Term-End Examination
December, 2015

BIME-011 : MACHINE DESIGN – II

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **five** questions. Question no. **1** is **compulsory**. Use of machine design data book and scientific calculator is permitted. Assume missing data suitably.*

1. Select the most appropriate answer :   *7×2=14*

    (a) When a shaft transmits power through gears, the shaft experiences :

    (i)   torsional stress alone

    (ii) bending stress alone

    (iii) constant bending and varying torsional stresses

    (iv) constant torsional and varying bending stresses

    (b) Thickness of tooth is measured along :

    (i)   root circle

    (ii) pitch circle

    (iii) addendum circle

    (iv) dedendum circle

(c) The range of pressure angle for spur gears is :

(i) 5 – 15 degree

(ii) 15 – 20 degree

(iii) 20 – 30 degree

(iv) 30 – 40 degree

(d) A worm has a lead angle of 22·5°. This corresponds to a helix angle of :

(i) 22·5 degree

(ii) 45 degree

(iii) 67·5 degree

(iv) 90 degree

(e) For buckling in a plane perpendicular to the plane of motion (about the y-axis), the connecting rod is treated as a strut with :

(i) both ends hinged

(ii) both ends fixed

(iii) one end fixed and the other end hinged

(iv) one end fixed and the other end free

(f) Which tooth profile is preferred for very heavy load and to withstand wear resistance ?

(i) 14·5 degree stub involute

(ii) 14·5 degree full depth involute

(iii) 20 degree sub involute

(iv) 20 degree full depth involute

(g) In the Lewis equation, the working stress depends upon :

(i) material of the tooth only

(ii) pitch line velocity only

(iii) load conditions as well as material of the tooth

(iv) pitch line velocity, load conditions and material of the tooth

2. Determine the proper pitch, module, face, number of teeth and outside diameters of a pair of 20° involute full depth spur gears to transmit 120 kW, from a pinion running at 750 rev/min to a gear running at 140 rev/min. The service is intermittent with light shocks.   *14*

3. Design a pair of equal diameter, 20 degree stub tooth helical gears to transmit 38 kW with moderate shock at 1200 rev/min. The two shafts are parallel and 0·45 m apart. Each gear is to be of steel. Find the module and face width of the teeth.   *14*

4. Design a bearing and journal to support a load of 4500 N at 600 rev/min using a hardened steel journal and a bronze backed babbitt bearing. The bearing is lubricated by oil rings. Take room temperature as 21°C and the oil temperature as 80°C.   *14*

5. The spindle of a wood working machine revolves at 1000 rev/min and it is to be mounted on two single row radial ball bearings. The bearing 'X' is subjected to a radial load of 2250 N and a thrust load of 1900 N. Bearing 'Y' is subjected to a radial load of 2250 N only. The machine is to be used approximately 8 hrs per day and an average service life of 10 years is desired. If the diameter of the spindle is not to exceed 300 mm, select the suitable bearings. *14*

6. Design a worm gear set to transmit 15 kW from a shaft rotating at 1600 rpm to another shaft rotating at 80 rpm. *14*

7. (a) Discuss the various design considerations for an I.C. Engine.

(b) List the various materials used for pistons. What are the functions of piston rings ? *7+7*