| BIME-011 |

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

☐☐☐23.   June, 2018

BIME-011 : MACHINE DESIGN – II

Time : 3 hours   *Maximum Marks : 70*

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

1. Select the correct answer and write it in the answer book :   *7×2=14*

    (a) Which of the following is the main advantage of hydrodynamic bearing over roller bearing ?

         (i)   Easy to assemble

         (ii) Relatively low cost

         (iii) Better load carrying capacity at higher speeds

         (iv) Less frictional resistance

(b) Spiral gears are suitable for transmitting
 (i) small power
 (ii) huge power
 (iii) no power but motion only
 (iv) pulsating power

(c) Lewis equation in gears is used to find the
 (i) tensile stress
 (ii) compressive stress in bending
 (iii) fatigue stress
 (iv) endurance stress

(d) Low pressure angle in gears results in
 (i) weaker teeth
 (ii) stronger teeth
 (iii) thin teeth
 (iv) thick teeth

(e) Compared to spur gears, helical gears
 (i) run with more vibration and noise
 (ii) run more smoothly
 (iii) consume more power
 (iv) consume less power

(f) Interference is inherently absent in the following type of gears :
 (i) Involute
 (ii) Stub
 (iii) Cycloidal
 (iv) Epicycloid

(g) The backlash required for spur gears depends on

(i) module

(ii) tooth profile

(iii) pitch line velocity

(iv) both module and pitch line velocity

2. Suggest a suitable bearing (with specifications) which is to operate at 1600 rpm and is acted upon by an 8000 N radial load and 5000 N thrust load. The inner ring rotates, the load is steady and the service is continuous. The shaft diameter, from strength consideration, is 45 mm and the life expectancy is 500 hours. *14*

3. A pair of straight teeth spur gears is to transmit 22 kW when the pinion rotates at 320 rpm. The velocity ratio is 1 : 3. The allowable static stresses for the pinion and gear materials are 120 MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. Determine : (a) module (b) pitch circle diameters of both the pinion and gear taking into consideration the effect of the dynamic loading. The tooth form factor y can be taken as

$$y = 0\cdot154 - \frac{0\cdot912}{\text{No. of teeth}}$$

and the velocity factor $C_V = \frac{3}{3 + V}$, where V is expressed in m/s. *14*

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

5. A pair of helical gears have to transmit 12 kW. The teeth are 20° stub in diametral plane and have a helix angle of 45°. The number of teeth on the pinion is 20, and runs at 10,000 rpm. The number of teeth on the gear is 80. If the gears are made of cast steel having static strength of 100 MPa, determine the required face width. *14*

6. A four-stroke diesel engine has the following specifications :

Brake power	=	6 kW
Speed	=	1200 rpm
Indicated mean effective pressure	=	0·35 N/mm^2
Mechanical efficiency	=	75%

Determine :

(a) Bore and length of the cylinder,

(b) Thickness of the cylinder head, and

(c) Size of studs for the cylinder head. *14*

7. (a) Discuss the procedure of designing a connecting rod for a four-stroke petrol engine.

(b) Describe piston rings and their functions. List the various materials used for the piston and piston rings. *7+7*