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BIME-011

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

00626

Term-End Examination

June, 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 (if any) suitably.*

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

(a) Resilience of a material is important when subjected to

(i) fatigue

(ii) wear and tear

(iii) shock loading

(iv) inertia loading

(b) When two shafts are neither parallel nor intersecting, power can be transmitted by using

(i) a pair of spur gears

(ii) a pair of helical gears

(iii) an Oldham's coupling

(iv) a pair of spiral gears

(c) Size of the gear is generally specified by

(i) pitch circle diameter

(ii) working depth

(iii) module

(iv) tooth thickness

(d) In a single reduction, a large velocity ratio is required. The best transmission is

(i) spur gear drive

(ii) helical gear drive

(iii) bevel gear drive

(iv) worm gear drive

(e) A connecting rod should be

(i) strong in buckling about x-axis only

(ii) strong in buckling about y-axis only

(iii) equally strong in buckling about both x-axis and y-axis

(iv) more strong in buckling about x-axis than that about y-axis

(f) Two mating spur gears have 70 and 30 teeth respectively. Corresponding to a module pitch 5 mm, the centre to centre distance between the gears will be

(i) 125 mm

(ii) 250 mm

(iii) 375 mm

(iv) 500 mm

(g) In the formulation of Lewis equation for toothed gearing, it is assumed that tangential tooth load acts on the

(i) pitch point

(ii) tip of tooth

(iii) root of the tooth

(iv) whole face of the tooth

2. A compressor running at 400 rev/min is driven by a 15 kW, 1600 rev/min motor through $14\frac{1}{2}°$ full depth gears. The centre distance is 0·375 m. The motor pinion is to be of C-30 forged steel hardened and tempered, and the driven gear is to be of cast steel. Assuming medium shock condition :

(a) Determine the module, the face width, and the number of teeth on each gear.

(b) Check the gears for dynamic load and wear.

(c) Design the drive completely. *14*

3. Two shafts 0·30 m apart transmitting 20 kW are to be connected by a steel pinion meshing with cast iron gears. The velocity ratio is to be 3 to 1 and the smaller gear is to run at 600 rev/min. The ultimate strength of the material for the gear material is 168 MPa and the factor of safety is 4. Design the arms for the gear and find the diameter of the gear shaft. *14*

4. Determine the safe power which can be transmitted by a pair of helical gears, 20-degree full depth, 25-degree helix, having a normal module of 5 mm. Both the gears are made of forged C-30 steel and have a face width of 77 mm. The pinion speed is 2000 rev/min and it has 20 teeth. The velocity ratio is to be 5 to 1. *14*

5. Determine the main dimensions of a multi-collar thrust bearing for a propeller shaft of a 460 kW power marine oil engine. The engine runs at 220 rev/min, the shaft diameter is 0·15 m and the propeller has a pitch of 2·50 m. Assume a slip of 25%. *14*

6. A journal bearing is proposed for a centrifugal pump. The diameter of the journal is 0·15 m and the load on it is 38 kN and its speed is 900 rev/min. Complete the design calculation for the bearing. *14*

7. (a) Discuss the effect of number of cylinders on the performance of an I.C. Engine.

   (b) What is the effect of stroke to bore ratio on the design of an I.C. Engine ? Explain. *7+7*
