

2024 = 2006

SHAHEED BHAGAT SINGH STATE TECHNICAL CAMPUS, FEROZEPUR

ROLL NO:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Total number of pages: [2]

Total number of questions: 06

B. Tech. || ME || 6<sup>th</sup> Semester

Design of Machine Elements - II

Subject Code: BTME-603A/605A/ 601 (R4/RP)

Paper ID: M118

(2011 batch onwards) Max Marks: 60

Time allowed: 3 Hrs

Important Instructions:

- All questions are compulsory
- Assume any missing data
- Design Data book is allowed in the examination.

**PART A (2×10)**

Q. 1. Answer in brief:

- (a) What are the elements of belt drive?
- (b) What are the applications of roller contact bearing?
- (c) What are the advantages of helical gears over spur gear?
- (d) What do you understand by nipping in laminated spring?
- (e) Give two applications of hydrodynamic journal bearing.
- (f) Describe hoisting and hauling chains.
- (g) What is the function of a flywheel?
- (h) How will you classify brakes?
- (i) Under what circumstances a fibre rope and a wire rope is used?
- (j) Why clutches are usually design on the basis of uniform wear?

**PART B (5×8marks)**

**Q2** A gear drive is required to transmit a maximum power of 22.5kW. The velocity ratio is 1:2 and r.p.m. of the pinion is 200. The approximate centre distance between the shafts may be taken as 600mm. The teeth have 20° stub in-volute profiles. The static stress for the gear material (which is cast iron) may be taken as 60MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear. Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham equation may be taken as 80 and the material combination factor for the wear as 1.4. **CO1**

OR

It is required to design a flat belt drive for a compressor running at 720 r.p.m., which is driven by 25kW, 1440 r.p.m. motor. Space is available for a centre distance of 3m. The belt is open type. **CO1**

- Q3** With the help of a neat sketch, show the pressure distribution in a journal bearing. What is the procedure followed in designing a journal bearing? **CO2**

OR

A single row deep groove ball bearing is subjected to a radial force of  $8kN$  and a thrust force of  $3kN$ . The shaft rotates at  $1200rpm$ . The expected life  $L_{10h}$  of the bearing is 20000 hours. The minimum acceptable diameter of the shaft is  $75mm$ . Select a suitable ball bearing for this application. **CO2**

- Q4** A punching machine makes 25 working strokes per minute and is capable of punching  $25mm$  diameter holes in  $18mm$  thick steel plates having ultimate shear strength of  $300MPa$ . The punching operation takes place during  $1/10^{th}$  of a revolution of the crank shaft. Estimate the power needed for the driving motor, assuming a mechanical efficiency of 95 percent. Determine suitable dimensions for the rim cross-section of the flywheel, which is to revolve at 9 times the speed of the crank shaft. The permissible coefficient of fluctuation of speed is 0.1. The flywheel is to be made of cast iron having a working stress (tensile) of  $6MPa$  and density of  $7250 kg/m^3$ . The diameter of the flywheel must not exceed  $1.4m$  owing to space restrictions. The hub and the spokes may be assumed to provide 5% of the rotational inertia of the wheel. **CO3**

OR

A single cylinder double acting steam engine delivers  $185kW$  at  $100rpm$ . The maximum fluctuation of energy per revolution is 15% of the energy developed per revolution. The speed variation is limited to 1% either way from the mean. The mean diameter of the rim is  $2.4m$ . Design and draw two views of the flywheel. **CO3**

- Q5** A safety valve of  $60mm$  diameter is to blow off at a pressure of  $1.2MPa$ . It is held on its seat by a close coiled helical spring. The maximum lift of the valve is  $10mm$ . Design a suitable compression spring of spring index 5 and providing an initial compression of  $35mm$ . The maximum shear stress in the material of the wire is limited to  $500MPa$ . The modulus of rigidity for the spring material is  $80GPa$ . Calculate: (i) Diameter of the spring wire (ii) Mean coil diameter (iii) Number of active turns, and (iv) Pitch of the coil. **CO4**

OR

A locomotive semi-elliptical laminated spring has an overall length of  $1m$  and sustains a load of  $70kN$  at its centre. The spring has 3 full length leaves and 15 graduated leaves with a central band of  $100mm$  width. All the leaves are to be stressed to  $400MPa$ , when fully loaded. The ratio of the total spring depth to that of width is 2.  $E = 210GPa$ . Determine thickness and width of the leaves. **CO4**

- Q6** A multi-disk clutch consists of five steel plates and four bronze plates. The inner and outer diameters of friction disks are  $75mm$  and  $150mm$  respectively. The coefficient of friction is 0.1 and the intensity of pressure on friction lining is limited to  $0.3MPa$ . Assuming uniform wear theory, calculate (i) the required operating force (ii) power transmitting capacity at  $750rpm$ . **CO5**

OR

What do you understand by self energising brake? Also discuss the different types of brakes giving at least one practical application for each. **CO5**

\*\*\*\*\*