

B.E. (Mechanical) (Sem -VII) (CBSEGS)

[Time: 03 Hours]

[Total marks: 80]

- N.B.:**
1. Question No 1 is **compulsory**
 2. Solve **Any Three** questions from the remaining **Five** questions.
 3. Assume any **suitable data** if necessary with justification.
 4. Use of **Standard Data Book** is permitted
 5. Figures to the right indicate full marks.

Q1. Attempt any **Four** of the following.

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| (a) | With neat sketch explain force analysis of Bevel Gear? | 05 |
| (b) | Derive Levis Beam Strength Equation? | 05 |
| (c) | Why it is necessary to dissipate the heat generated when clutch operate? | 05 |
| (d) | How various factors influence the life of a bearing? | 05 |
| (e) | What is the significance of Pressure angle in cam and follower? | 05 |

Q2. A pair of spur gear is used to transmit power at 8kW from a motor rotating at 960 rpm to a machine with approximate reduction ratio of 3.7 20

- i) Select suitable material for pinion and gear,
- ii) Determine the module and face width of the gear to satisfy strength and wear.
- iii) Check the gear for dynamic load using Buckingham's formula

Describe the constructional details of gear and pinion.

- Q3.** (a) A worm reduction unit is required to transmit 15 kW power from an electric motor operating at 1440rpm. The output speed is 72 rpm and the load is with mild shock, normal duty. Determine 15
- a. Selecting suitable material and design stresses
 - b. Design worm and worm wheel for strength and wear
 - c. Check for heat dissipation capacity
- (b) Discuss the polygon effect in chain drive. 05

Q4. A rotating disc cam and central translatory follower has following follow motion 20

Forward stroke of 25 mm is 120° rotation of cam with SHM. Dwell of 60° of cam rotation return stroke of 25 mm with SHM is 100° of cam rotation remaining dwell to complete the cycle. Mass of the follower is 1 kg and the cam shaft rotates at 500 rpm. Maximum pressure angle is 25° during forward stroke. The external force is 300 N during forward stroke and 50 N during return stroke.

- i) Determine Base Circle Radius
- ii) Design Cam
- iii) Design spring
- iv) Calculate the maximum cam shaft torque.

- Q5. (a)** A radial load on 360° hydro dynamically lubricated self-contained bearing supports 20kN. The journal rotates at 1200 rpm. Assuming journal length to its diameter as 1 and suitable fit between journal and bearing. Design average clearance, check bearing heat dissipation bearing pressure must not exceed 1.5N/mm^2 . **12**
- (b)** 75 kW power is transmitted by multi-plate clutch at 3000 rpm. The plates run in oil and coefficient of friction is 0.07. Axial intensity of pressure is not to exceed 0.15N/mm^2 . Due to space limitation external radius is restricted to 125 mm. Assuming number of springs as 6. Design Input and Output Shaft. **08**
- 6. (a)** A flat belt drive is used to transmit 6 kW power from an electric motor rotating at 1440 rpm to the blower operating at 400 rpm for 10 hours/ day and the expected life of belt is two and half years approximately. Centre to centre distance is 950 mm. Find **12**
- a. Driving and Driven pulley diameter.
 - b. Considering Rubber Canvas Material for the belt, determine the thickness and width of the belt.
- Determine driving and driven shaft diameter considering torque only.
- (b)** DGBB is selected for an intermediate shaft of helical gear box which is subjected to an axial load of 5 kN and radial load of 12kN when operating on 600 rpm. Select suitable bearing if it is required to have life of 20000 hours with probability of survival 92%. **08**
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