K.D.K. COLLEGE OF ENGINEERING, NAGPUR
DEPARTMENT OF MECHANICAL ENGINEERING
PUT ONLINE SESSIONAL EXAM - 2021-22

SEMESTER:-VII Sem. (A,B & II shift) Total Marks : - 40
SUBJECT :- Design of Mechanical Drives (BEME705T) Time :- 1 hr 30 min

1. **CO 1:-** Design of Coupling, flywheel and bearings (UNIT 1)
2. **CO 2:-** Design of Flat Belt, V-Belt Roller chain and Wire rope Drive (UNIT 2)
3. **CO 3:-** Design of Helical Gears (UNIT 3)
4. **CO 4:-** Design of Worm drive and I.C. Engine components (UNIT 4)

BTL indicates bloom taxonomy level 1. Remember 2. Understand 3. Apply 4. Analyze 5. Evaluate 6. Create

NOTE: **Solve any 2** out of 4 questions

Q.1 (a): Suggest suitable weight and cross section for the rim of a C.I. flywheel to be used on a 4 stroke I.C. engine develops 40 kW at 600 rpm. The total fluctuation of speed should be limited to 5 percent of the mean speed. The work done during the power stroke may be assumed to be 1.4 times the work done during the whole cycle. The flywheel diameter should not be greater than 1.2 m. [BTL3, 4
(10 marks)

Q.1 (b): A 75 mm diameter machine shaft is to be supported at an end. If operates continuously for 8 hrs / day, 300 days / year for 12 years. The load and speed cycle for bearing is as follows:

Sr. No.	Fraction of cycle	Radial load (KN)	Thrust load (KN)	Speed (rpm)	Types of load
1.	0.25	3	1.5	1000	Light shock
2.	0.25	2	1	1500	Moderate shock
3.	0.5	2.5	1.2	800	Steady

Select suitable bearing No. [BTL3, 4] (10 marks)

Q.2 (a): What are the advantages of roller chain drive over belt drive? [BTL1, 2]
(5 marks)

Q.2 (b): A 37 kW, 960 rpm, A.C. split phase motor is to drive a pump at a speed of 320 rpm. The pump is for 12 hours per day service. The centre distance is to be approximately 1.25 m. Determine the details of a multiple V belt drive i.e. Pulley diameters, section and number of V belts. Also design and draw a neat sketch of the pulley on the pump shaft. [BTL3, 4]
(15 marks)

Q.3: In a reciprocating compressor, power is to be supplied by 960 rpm motor to the compressor shaft rotating at 300 rpm through helical gears. Torque to which compressor shaft is subjected is 450 N-m. Assume material of pinion and gear as steel having basic strength 195 MPa, and helix angle 23^{o}. Design the gear pair and also design gear blank. [BTL3, 4] (20 marks)

Q.4: An elevator cage is lifted at the rate of 100 m/min. The elevator drum diameter is 600 mm and the load to be lifted is 20 KN. The worm gear is keyed to the drum shaft. The elevator is driven by an electric motor running at 960 rpm. Determine (a) the worm and worm

gear proportions (b) the temperature rise of the oil and (c) The required power of the motor if the efficiency of the hoist is 94 percent. [BTL3, 4]

(20 marks)

========BEST LUCK=========

K.D.K. COLLEGE OF ENGINEERING, NAGPUR
DEPARTMENT OF MECHANICAL ENGINEERING
First Online Sessional Exam 2021-22

SEMESTER:-VII Sem. (A,B & II shift) Total Marks : - 20 SUBJECT :- Design of Mechanical Drives (BEME705T)
Time :- 1 hrs.

1. **CO 1:-** Design of Coupling, Design of Flywheel, Design of Bearings (UNIT 1)
2. **CO 3:-** Design of Gears (UNIT 3)

BTL indicates bloom taxonomy level 1. Remember 2. Understand 3. Apply 4. Analyze 5. Evaluate 6. Create

Q.1 (a): Design a bush pin flexible coupling to connect output shaft of motor to the shaft of Centrifugal pump. The motor delivers 20 KW power at 720 rpm. Starting torque of motor can be assumed to be 150% of rated torque. Design the coupling and specify its dimensions. [BTL3, 4]
(10 marks)

Q.1 (b): A single row deep groove ball bearing is subjected to a radial force of 8kN and axial force of 3kN. The shaft rotates at 1200 rpm with light shock. The expected life of bearing is 20,000 hours.
The minimum acceptable diameter of shaft is 75 mm. Select suitable ball bearings for this application. [BTL3, 4]
(10 marks)

OR

Q.2: Design a spur gear drive for transmitting 20kW at 1440 rpm to another Shaft running at 400 rpm. The load is medium shock for 8 to 10 hrs per day. The material used is SAE 1045 heat treated for both pinion and gear. Select 20^{o} full depth tooth profile. Also design gear blank. [BTL3, 4]
(20 marks)

========BEST LUCK=========

K.D.K. COLLEGE OF ENGINEERING, NAGPUR
DEPARTMENT OF MECHANICAL ENGINEERING
Second Sessional Exam 2021-22

SEMESTER:-VII Sem. (A,B & II shift) Total Marks : - 20 SUBJECT :- Design of Mechanical Drives (BEME705T)
Time :- 1 hrs.

1. **CO 2:-** Design of Flat Belt, V-Belt and Wire rope Drive (UNIT 2)
2. **CO 3:-** Design of Helical Gears (UNIT 3)

BTL indicates bloom taxonomy level 1. Remember 2. Understand 3. Apply 4. Analyze 5. Evaluate 6. Create

Q.1 (a): A belt is required to transmit 20 kW from a pulley 1.2 m diameter running at 250 rpm to another pulley which runs at 450 rpm. The distance between the centres of pulleys is 2.7 m. The centre line of the drive makes an angle of 50^{o} with the horizontal. Specify suitable flat leather belt for the drive. [BTL4, 5]
(10 marks)

Q.1 (b): Design a suitable wire rope for a mine hoist carrying a load of 30 kN to be lifted from a depth of 100 m. A rope speed of 10 m/sec must be attained in 10 seconds. [BTL4, 5]
(10 marks)

OR

Q.2: In a reciprocating compressor, power is to be supplied by 960 rpm motor to the compressor shaft rotating at 300 rpm through helical gears. Torque to which compressor shaft is subjected is 450 N-m. Assume material of pinion and gear as steel having basic strength 195 MPa, and helix angle 23^{o}. Design the gear pair and also design gear blank. [BTL4, 5]
(20 marks)

========BEST LUCK=========