Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (NEW) EXAMINATION – WINTER 2017

Subject Code: 2182004 Date: 18/11/2017

Subject Name: Design of Mechanisms - II

Time:02:30 PM TO 05:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What are the mis-alignment between two connecting shaft? What are the advantages and disadvantages of rigid coupling and flexible coupling?	**03**
	(b)	Explain the importance of ergonomics and aesthetic consideration in machine design.	**04**
	(c)	Design a cast iron protective type flange coupling to transmit 15 KW at 900 r.p.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stress may be used: Shear stress for shaft, bolt & Key material = 40 MPa Crushing stress for bolt & Key =80 MPa Shear Stress for Cast iron = 8 MPa	**07**
Q.2	**(a)**	Derive the necessary expressions for Energy absorbed and heat dissipation in brakes.	**03**
	(b)	What is Muff Coupling? Give advantages Disadvantages & Limitations of Muff Coupling.	
	(c)	A Differential band brake has a force of 220 N applied at the end of a leaver s sho0wn in Fig .1.1. The coefficient of friction between the band and the drum is 0.4. The angle of lap is 180°. Find: 1.The maximum and minimum force in the band when a clockwise torque of 450 N-m is applied to the drum; and 2. The maximum torque that the brake may sustain for counter clockwise rotation of drum.	**07**
		OR	
	(c)	Differentiate between simple and band brake. Explain self locking condition for a band brake with neat sketch and related equations.	**07**
Q.3	**(a)**	Compare Self –Energizing & self –locking block brake	**03**
	(b)	Explain step by step procedure of designing flat belt pulley with neat sketch.	**04**
	(c)	A cantilever beam of rectangular cross section is to be used to support a pulley as shown in figure 1.2. The tension in the wire rope is 4.5 kN . If the ratio of depth to width of cross section is 2.5. Determine the dimension of beam cross section. The material has been allowable tensile stress is 100 MPa & Compressive stress is 120 MPa.	**07**
		OR	
Q.3	**(a)**	Define the rating life of the bearing. What is L50 life of bearing?	**03**
	(b)	Explain the Importance of Reliability in detail.	**04**

(c) A pair of straight teeth spur gear is to transmit 20 KW when the pinion rotates at 300 r.p.m. The velocity ratio is 1:3. The allowable static stresses for the pinion & gear material are 120 MPa & 100 MPa respectively. The pinion has 15 teeth & its face width is 14 times the module. Determine: 1) Module 2) Face Width. 3) pitch circles diameters of both the pinion & the gear from the standpoint of strength only taking consideration the effect of the dynamic loading . **07**

The tooth form factor y can be taken as

$$y = 0.154 - \frac{0.912}{no\ of\ teeth}$$

Q.4 **(a)** Define following Terms : i) Addendum Circle ii) Circular Pitch iii) Pitch Circle **03**

(b) Explain the hydrodynamic, Boundary and hydrostatic lubrication. **04**

(c) A full Journal bearing of 50 mm diameter and 100 mm long has a bearing pressure of 1.4 N/mm^2. The speed of the journal is 900 r.p.m & the ratio of journal diameter to the diameter clearance is 1000. The bearing is lubricated with oil whose absolute viscosity at the operating temperature of 75°C may be taken as 0.011 kg/m-s. The room temperature is 35°C. Find: 1. The amount of artificial cooling required & 2. The mass of lubricated oil required if the difference between the outlet & inlet temperature of the oil is 10° C. Take specific heat of the oil as 1850 J/Kg/°C. **07**

OR

Q.4 **(a)** Explain the Belt slip and Creep. **03**

(b) Define: i) Antifriction Bearing:
ii) Static & Dynamic load carrying capacity of bearing **04**

(c) Derive the expression for the effort 'P' to be applied to lift load 'Q' in hoisting and tackle mechanism having more than one pulley. **07**

Q.5 **(a)** Give advantages & disadvantages of rolling contact bearing over sliding bearing. **03**

(b) Briefly discuss the stresses in wire ropes with related equations. **04**

(c) Briefly discuss the 'beam strength of the gear tooth' giving related equations and figures. **07**

OR

Q.5 **(a)** What is Bearing? Classify it. Advantages of any one of them. **03**

(b) What is meant by Stress Concentration & Endurance Limit? **04**

(c) A circular bar of 500 mm length is supported freely at its two ends. It is acted upon by a central concentrated cyclic load having minimum value of 20 kN and maximum value of 50 kN. Determine the diameter of the bar by taking factor of safety of 1.5, size effect of 0.85, and surface finish factor of 0.9. The material properties of bar are given by : ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa. **07**

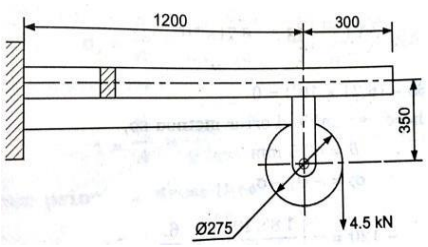

Fig 1.2

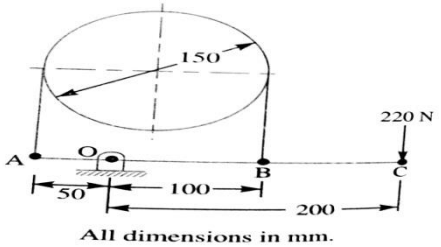

Fig 1.1

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