(17) D

SCHEME OF VALUATION (B)

(Scoring Indicators)

Revision	Co	urse Code	e: 5021	
Qst. No.		Split up	Sub Total	Total
I. 1.	PART. A It is the distance moved by the threaded part parallel to the screw axis in one complete rotation.	2		2
I. 2.	It is defined as the ratio between the ideal effort to the actual effort.	2		2
I. 3.	i. to connect shafts ii. To provide mis alignment. lii. To alter vibration. iv. To transmit power.	1	1x2	2
I. 4.	The function of flywheel is to act as reservoir of energy in a machine.	2		2
I. 5.	The relative motion between the pulleys and the belt is called slip of belt.	2		2
	i. Convenient to asemble and disassemble. Ii. Highly reliable joints in operation. Iii. Can be placed in any positon. iv. Compact construction. v. May be adopted to various operating conditions. vi. Economical to manufacture.	1	1 x 6	6
II.2.	No. of screws $n = 2$ Tensile load $P = 10 \text{ kN} = 10 \times 10^{8} \text{ N}$ Working stress = 45 MPa $P = \frac{11}{4} de^{2} 64 \cdot n$ Cose dea: of bolt $de = \sqrt{\frac{4P}{1164}n} = \sqrt{\frac{4 \times 10^{4}}{11 \times 45 \times 2}}$ $= \frac{11-89 \text{ mm}}{0.84}$ No menal dea of bolt $d = \frac{10 \times 10^{8}}{0.84} = \frac{14.16 \text{ mg}}{0.84}$		2+2+2	6

II.3.		T	T	Ι
	T = Twisting moment or torque N-mm	20		
	J = Polar moment of inertia mm4			
	t = Torsional shear stress MPa			
	r = Radius of shaft mm			
	From torsion equation I = E			
	T2 = 5			
	J = TT d , d = dia = of shaft.	6		6
-	$ \mathcal{J} = \frac{\pi d^4}{32}, d = \text{dia} = \text{of sheff}. $ $ \mathcal{T} = \frac{Z}{4_2} \cdot \frac{\pi d^4}{32}, 8 = \frac{d_2}{2} $ $ \mathcal{T} = \frac{\pi}{16} = \frac{3}{16} $			
,	T = 11/2 2 23			
II.4.	According to the shape of the surface in contact.			
	i. Kinfe edge follower	9		
	ii. Roller follower			
	iii. Flat face or mushroom ended follower.			
	iv. Spherical face follower.			
	2. According to the motion of the follower.		2+2+2	6
	i Reciprocating or translating follower.	2_		
	ii. Oscillating follower			
	3. According to the location of line of movement of the follower.			
	i. Radial follower	2_		
	ii. Offset follower.			
II.5.	<u>Flywheel</u> <u>Governo</u> r			
	1. Stores and distributes energy 1. Contriols the amount of fuel			
	2. Takes care of fluctuations of speed. 2. Takes care of speed on load			
	3. Works continuously. 3. Works intermittenly.			
	4.No control over quantity and quality 4. Takes care of quantity and			
	of working agent. of working agent.	1	6 x 1	6
	5.Is not an essential element of every 5.Is an essential element of every			
	prime mover. prime mover.			
	6.Used only in case when undesirable 6.It is an adjuster of supply of fuel			
	cyclic fluctuation of energy. with demand.			
			-	

Velocity ratio gives a relation between the speed of driven and driver. It is defined as the ratio of speed of driven pulley to that of the driving pulley. Due to the slip between the belt and pulley, the VR of drive is not exact. N1 = Rotational speed of driving pulley in rpm. N2 = Rotational speed of driven pulley in rpm. d1 = Diameter of driving pulley in mm. d2 = Diameter of driven pulley in mm. Surface speed of driving pulley v1 = Tl d1 N1 Surface speed of driving pulley v2 = Tl d2 N2 Assume no slip v1 = v2 or Tl d1 N1 = Tl d2 N2 d1 N1 = d2 N2 V.R = N2/N1 = d1/d2 VR = Speed of follower/Speed of driver If thickness of belt considered VR = N2/N1 = d1+t/d2+t	6		6
II.7. 1.Give positive drive and constant speed without slip. 2.More compact 3.Can be operated at higher speeds 4.High efficiency 5.Lighter loads on shafts and bearings 6.Used where precise timing is desired 7.Wide range of power transmitted. 8.Less maintenance. 9.Can be used for non intersecting and non parallel shafts	1	1×6	6

111.a.

déa: of Screw d = 40 mm poteh b = 8.5 mm M = 0.15

Tensión force W = 8000 N

Mean décrameter dan = d - 0.5 p = 40 - 0.5 x 85

2 35.75 mm

Helex angle & 2 tan (np)

= ton (1x8.5) = 4.33°

Friedrich eagle \$ = tois 1 10.15 = 8.53°

Torque required to overscome friction

To Wtan (xtp) dm

= 8000 tan (4.33 + 8.53) x 35.25

2 32646-32 N-mm

= 32.65 N-m

Total torque required to tighten both ends of the rods

7 = 2 x 32-65 = 65.3 N-m

1

1/2

1 1/2

3

2

III.b.	The land while of a framer		T	-
111.0.	Diornodes of Shaff d = 40mm	2.1		
	Tagendial force F = 20 KN			
1	2 20 × 10 3 N			
	Stress Z 2 60 MPa			
	= 60 N/mm2			
	A Section 1 in the section of the section 1 in the sectio			
	Width of key w = dy = 40 = 10 mm	1		
	Thèlenen t = 40 = 40 = 6.67 mm			
	$\sim 7 \text{ mg}$,		,
	$\approx 7 \text{man}$,/		6
	P = l. w. Z			
<u> </u>	legth of key l = F			
	= 20 ×10 ³			
	10 x 60			
	= 33.33 man			
	= 34 mm	,		
	- (7 ma)	4		
	Size of key = 10x \$ x 34			1
-				
IV. a				
	Steam pressure Ps = 1,2 MPa			
	1/s = 1. 5/2)Pa			
	Back pressure Pb = 0.015 MPa			
	Exlânder dein: D= 300 mm			
	Tensile stren 6t = 45 MPa.			
	Effective Steam pressure P = Ps-Ps			
	= 1.2 - 0.015			
	= 1.185 ADPa	/		

IV.a.	Force on pièton rod P = ITD2 p) i		7.11
	= T x 300 x 1.185 4 = 83720.35.N	2		y.
	Resistance by sevened end			
	P = 11 de 5t			*
	Core dea : of screwed and			
	$dc = \sqrt{\frac{4P}{11.54}} = \sqrt{\frac{4 \times 83.720.28}{11 \times 45}}$	The same		9
	= 48-68 mm	4		
	Nominal diameter d = de			
- ,	0-84 = 48-68			
	= 48.68 0.84	***		į.
	2 57.95 mm.			10 VI
	2 58 man	2		
	Land to the second of	,s3	,	
<u></u>				

77.7.1				
IV.b.	Dia: of shaft d = \$5 man			
	width of key we = 12 mm			
	Wealth of key w= 12 mm Thickness t= 8 mm	4,		
	leight l 2 65 mm	=		
	Torque T= 750 N-m			
	= 750 × 10 N-man			
* * *	Z = 60 MPa	-		
	DE 2 150 MP			
1	Consider Rheaming 7 = l. w. Z. de			
	$Z = \frac{2.7}{l \cdot w \cdot d} = \frac{2 \times 750 \times 10^{3}}{65 \times 12 \times 90}$	15		
	2 48.08 N/mm2	3		6
*	Consider crusheig, 72 l. tz. 52. dz			
	Sc ≥ 4.7.	*		
	Lx txd.			(4)
A	= 4 x 750 x 10			
	65 x 8 x 40			
-	= 144.23 N/mm²	3	-	
	Induced strenes one len their permissible		- 1 x x h	
	Induced stresses one len their permissible stress hence the length is sufficient.			

P= 100 kW = 100 x10 W N= 200 rpm. Shaff = s = 50 mPa. cey = 2 50 mPa. cey = 15 mPa max = 15 mPa Tmax = 7 mean Design of shaff. 2	Design of Sheere Design of Sheere 100 km 2 100 x10 W 100 x10 W 100 x10 W 100 x10 W 100 x10 mm, 100 x 2 100 mp, 100 x 2 100 mp, 100 x 2 100 x10		•			
Shaff $\equiv_S = SO MPa$. $ cey = \sum_{k=1}^{\infty} SO MPa$ $ cey = \sum_{$	Shoff = 5 = 50 MPa. cey = 2 = 50 MPa. oc = 100 MPa. ming = Tmeen. Design of shoff. Tmean = \frac{60P}{2\pi N} = \frac{60 \times 100 \times 100}{2\pi \times 200} = \frac{4774.65 \times 4.00}{7\pi \times 50} \frac{3}{7\pi \times 50} \frac{3}{7\pi \times 50} = \frac{2}{3} \frac{167}{7\pi \times 50} \frac{3}{7\pi \times 50} = \frac{2}{3} \frac{16 \times 4774.65 \times 10^3}{7\pi \times 50} \frac{3}{7\pi \times 50} = \frac{2}{3} \frac{16 \times 4774.65 \times 10^3}{7\pi \times 50} \frac{3}{7\pi \times 50} = \frac{2}{3} \frac{16 \times 4774.65 \times 10^3}{7\pi \times 50} \frac{3}{7\pi \times 50} \frac{2}{7\times 50 \times 100} \frac{2}{7\times 50 \times 1	V.a.	P= 100 KW = 100 X10 W		- , -9	
Ley Z _k = SOMPa Not = 1500 MPa Not = 15 MPa There = Theren Design of shaft 2	cey $T_{k} = 50 \text{MPa}$ $\sigma C = 100 \text{MPa}$ $\sigma C = 15 \text{MPa}$ $T_{max} = T_{mean}$ $T_{mean} = \frac{60 P}{2 \text{TeV}} = \frac{60 \times 100 \times 10^3}{2 \text{TeV}} \times 200$ $2 \text{TeV} \times 65 \text{A/-m}$ $2 \text{TeV} \times 65 \text{A/-m}$ $2 \text{TeV} \times 65 \text{X} \times 10^3 \text{A/-mm}$ $2 \text{TeV} \times 65 \text{A/-m}$ $2 \text{TeV} \times 65 \text{X} \times 10^3 \text{A/-mm}$ $3 \text{TeV} \times 50$ $3 $	*				
only $Z_m = 15 MR_n$ $T_{max} = T_{mean}$ $T_{mean} = \frac{60P}{2\pi N} = \frac{60 \times 100 \times 10}{2\pi \times 200}$ $T_{mean} = \frac{60P}{2\pi N} = \frac{60 \times 100 \times 10}{2\pi \times 200}$ $T_{mean} = \frac{4774.65 \text{ a.m.}}{2\pi \times 200}$ $T_{mean} = \frac{4774.65 \times 10^3 \text{ N.mm.}}{2\pi \times 10^3 \text{ N.mm.}}$ Dia: of shaft $d = \frac{167}{3} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ $T_{mean} = \frac{16 \times 4774.65 \times 10^3}{\pi \times 50}$ T_{mean	my Zm = 15 MPa Those = Theory Desir of shelf: Theory = 60P = 60 × 100 × 10 ³ 2 T × 200 = 4774.65 N·m = 4774.65 × 10 ³ N·mm, Dia: of shelf d = 167 TT × 50 = 280 mm Desir of sleeve Inside dea: d = 80 mm. Outside dea: b = 2d + 13 mm = 2×80 + 13 = 173 mm Length L = 3.5d		Short Tis = 50 MPa.			
may $Z_m = 15 MR_n$ $T_{max} = T_{mean}$ Design of shaff. $T_{mean} = \frac{60P}{2\pi N} = \frac{60 \times 100 \times 10}{2\pi \times 200}$ $= \frac{4774.65 \text{ N-m}}{2774.65 \times 10^3}$ Dia: of shaff $d = \frac{167}{3\pi Z_5}$ $= \frac{16 \times 4774.65 \times 10^3}{\pi Z_5}$ $= \frac{16 \times 4774.65 \times 10^3}{\pi Z_5}$ $= \frac{28.64 \text{ nm}}{1.64.65 \times 10^3}$ Std. 62e $d = 80 \text{ mm}$. Outside dea: $d = 80 \text{ mm}$. Outside dea: $d = 20 \text{ mm}$.	Inox = Theon Design of shaft. Theor = 60P = 60 × 100 × 10 2 T × 200 = 4774.65 × 10 2 4774.65 × 10 A 100: of shaft d = 3/16T Tres = 16 × 4774.65 × 10 Tres = 78.64 am Std. 82e d = 80 mm Design of Sleeve Inside dea: d = 80 mm. Outside dea: D = 2d + 13 mm = 2×80 + 13 = 173 mm Length L = 3.5d					
Thor = Theory Desir of shaff. Theory = \frac{60P}{2\pi N} = \frac{60 \times 100 \times 10}{2\pi \times 200} = \frac{4774.65 \times N-m}{2\pi \times 200} = \frac{4774.65 \times \times 10^3 N-mm,}{17 \times 50} = \frac{16 \times 4774.65 \times 10^3}{17 \times 50} = \frac{767}{16 \times 4774.65 \times 10^3} \tag{3 \times 7 \times 50} = \frac{25.64 \times nm}{200 \times 64 \times 60} \text{ Design of Sleave} Inside dea: \text{ d = 80 mm.} Outside dea: \text{ D = 2d+13 mm}	Design of shalf. There = Thereon Design of shalf. There = 60P = 60 × 100 × 10 ³ 2 T × 200 = 4774.65 × 10 ³ N·mm. Dia: of shalf d = 16T / TZs = 16 × 4774.65 × 10 ³ TT × 50 = 280 mm Design of sleeve Inside dea: d = 80 mm. Owtside dea: D = 2d + 13 mm = 2×80 + 13 = 173 mm Length L = 3.5d		11 0c = 100 MPa		*	
Design of shaff. There = \frac{60P}{2\tau N} = \frac{60 \times 100 \times 100}{2\tau \times 200} = 4774.65 \times 4.m = 4774.65 \times 10^3 N.mm, Dia: of shaff d = \frac{167}{7\tau Zs} = \frac{16 \times 4774.65 \times 10^3}{7\tau Zs} = \frac{16 \times 4774.65 \times 10^3}{7\times 50} = 78.64 \times nm Std. \times 20 d = 80 mm Dessign of Sleeve Inside dea: \times 2 2d + 13 mm	Design of shaff.	1	only Zm = 15 MPa			
$T_{mean} = \frac{60P}{2\pi N} = \frac{60 \times 100 \times 10^{3}}{2\pi \times 200}$ $= \frac{4774.65 \text{ N-m}}{24774.65 \times 10^{3} \text{ N-mm}}$ $= \frac{4774.65 \times 10^{3} \text{ N-mm}}{\pi \times 50}$ $= \frac{16 \times 4774.65 \times 10^{3}}{\pi \times 50}$ $= \frac{78.64 \text{ nm}}{250}$ $= \frac{280 \text{ mm}}{250}$ Design of Sleave $\frac{100 \times 100 \times 10^{3}}{100}$ $= \frac{100 \times 100 \times 10^{3}}{2\pi \times 200}$ $= \frac{100 \times 100 \times 10^{3}}{100}$ $= \frac{100 \times 100 \times 100}{100}$ $= \frac{100 \times 100}{$	There = $\frac{60P}{2\pi N} = \frac{60 \times 100 \times 10^3}{2\pi \times 200}$ = $\frac{4774.65 \text{ N-m}}{24774.65 \times 10^3 \text{ N-mm}}$ Dia: of shaft $d = \frac{167}{3\pi Z_5}$ = $\frac{16 \times 4774.65 \times 10^3}{\pi Z_5}$ = $\frac{16 \times 4774.65 \times 10^3}{\pi Z_5}$ 3 Therefore $Z = 280 \text{ mm}$ Design of sheave Inside dea: $d = 80 \text{ mm}$. Owtside dea: $D = 2d + 13 \text{ mm}$ = $2 \times 80 + 13$ = 173 mm Leaft $L = 3.5d$		Tmax = Tmeen			
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2 4774.65 W-m 2 4774.65 W-m 2 4774.65 X10 ³ W-mm, Dia: of shaft d = \frac{167}{17\in 17\is 50} = \frac{16 \times 4774.65 \times 10^3}{17\in 50} = \frac{2}{16 \times 4774.65 \times 10^3} \tag{17 \times 50} = \frac{2}{280 \times 64 \times mm} \text{Design of Sleeve} Inside dea: \text{dea: d = 80 mm.} Outside dea: \text{D = 2d + 13 mm} = 2\times 80 + 13 = \frac{173 \text{mm}}{173 \text{mm}} Leagth L = 3.5d		Design of Shaff.	Ĺ		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		Thean 2 60P 2 60× 100×10 2 TX 200			
Dia: of sheft d = 3/167 TTZS = 16 x 4774.65 x 103 TT x 50 = 280 mm Design of sleeve Inside doa: d = 80 mm. Outside doa: D = 2d + 13 mm	Dia: of shaft d = 3/167 = 16 × 4774.65 × 103 T × 50 = 280 mm Std. 6/20 d = 80 mm. Design of Sleeve Inside dea: d = 80 mm. Outside dea: D = 2d+13 mm = 2×80 +13 = 173 mm Length L = 3.5d					
= 16 x 4774.65 x 10 ³ TT x 50 = 78.64 anm Std. 8i2e d = 80 mm Design of Sleeve Inside dea: d = 80 mm. Outside dea: D = 2d+13 mm	Design of Sleeve Inside dear d = 80 mm. Outside dear D = 2d + 13 mm = 2x80 + 13. = 173 mm Length L = 3.5d		2 4774.65×10 N-mm,		,	
2 78-64 ann Std. size d = 80 mm Desja of sleeve Inside dea: d = 80 mm. Outside dea: D = 2d+13 mm	2 78-64 anm Std. 8i2e d = 80 mm Design of sleeve Inside dea: d = 80 mm. Outside dea: D = 2d+13 mm = 2x80+13 = 173 mm Length L = 3.5d		Dia: of shaft d = 167 17 Zs			£
2 78-64 ann Std. size d = 80 mm Desja of sleeve Inside dea: d = 80 mm. Outside dea: D = 2d+13 mm	2 78-64 anm Std. 8i2e d = 80 mm Design of sleeve Inside dea: d = 80 mm. Outside dea: D = 2d+13 mm = 2x80+13 = 173 mm Length L = 3.5d	*** .	= /16 x 4774.65 x 103			1
Design of sleeve Inside dear de 2 80 mm. Outside dear D = 2d+13 mm	Std. 82e $d = 80 \text{ mm}$ Design of Sleeve Inside dea: $d = 80 \text{ mm}$. Outside dea: $D = 2d + 13 \text{ mm}$ $= 2 \times 80 + 13$ $= 173 \text{ mm}$ Length $L = 3.5d$		3/ TT × 50			
Design of sleeve Inside dear de 2 80 mm. Outside dear D = 2d+13 mm	Design of sleeve Inside dea: $d = 80 \text{ mm}$. Outside dea: $D = 2d + 13 \text{ mm}$ $= 2 \times 80 + 13$. $= 173 \text{ mm}$ Length $L = 3.5d$			3		
Inside dea: d = 80 mm. Outside dear D = 2d+13 mm	Inside dea: $d = 80 \text{ mm}$. Outside dea: $D = 2d + 13 \text{ mm}$ $= 2 \times 80 + 13$ $= 173 \text{ mm}$ Length $L = 3.5d$		Std. 8/20 d = 80 mm			
outside dear D = 2d+13 mm	Outside dear $D = 2d + 13 mm$ $= 2 \times 80 + 13$ $= 173 mm$ Length $L = 3.5d$		Desja of Sleeve	1 -0.48		
outside dear D = 2d+13 mm	Outside dear $D = 2d + 13 mm$ $= 2 \times 80 + 13$ $= 173 mm$ Length $L = 3.5d$		Inside dea: d = 80 mm.			
	= 2x80 +13. = 173 mm Length L = 3.5d					
= 2x80 +13	2 173 mm Length L 2 3.5d				M-2	
			t waster			
Length 1 = 3.5d			Length 1 = 3.5d			
			//			
				4		

A .	cheeling the show stress			
	7 = 11 To D3 (1-14)		2 ***	
	$Z_{m} = \frac{167}{\pi b^{3} (1-k^{4})}$			
	716 × 4774.65 × 103		V.	
	$\overline{I} \times 173^{3} \left[1 - \left(\frac{80}{733}\right)^{\frac{1}{7}}\right]$	3	<u> </u>	
	2 4-92 N/mm² < permissible valle			
	Design of key, Se 2 22 i. select square key		-	
, ,	$w = d_4 = \frac{80}{4} = 20 \text{ mm}$			7
	t 2 dy 2 89 2 20 mm			
-	l = 1 = 280 = 140 man			
	checking the strong			
	T2 l.w. Zk o/2	3		
	Zh 2 27 2x4774.65x103 140x20x80	, `		
	2 42-63 N/mon ²			
:	T2 l.ty. Se-42			
	Be = 47 2 4 x 4704.65 x 103 1.t.d = 4 x 4704.65 x 103 140 x 20 x 80			
	2 85.26 N/mm ²			
	londraed strong are len those peromissible			
	value hence desijos is safe.			
		- 17		

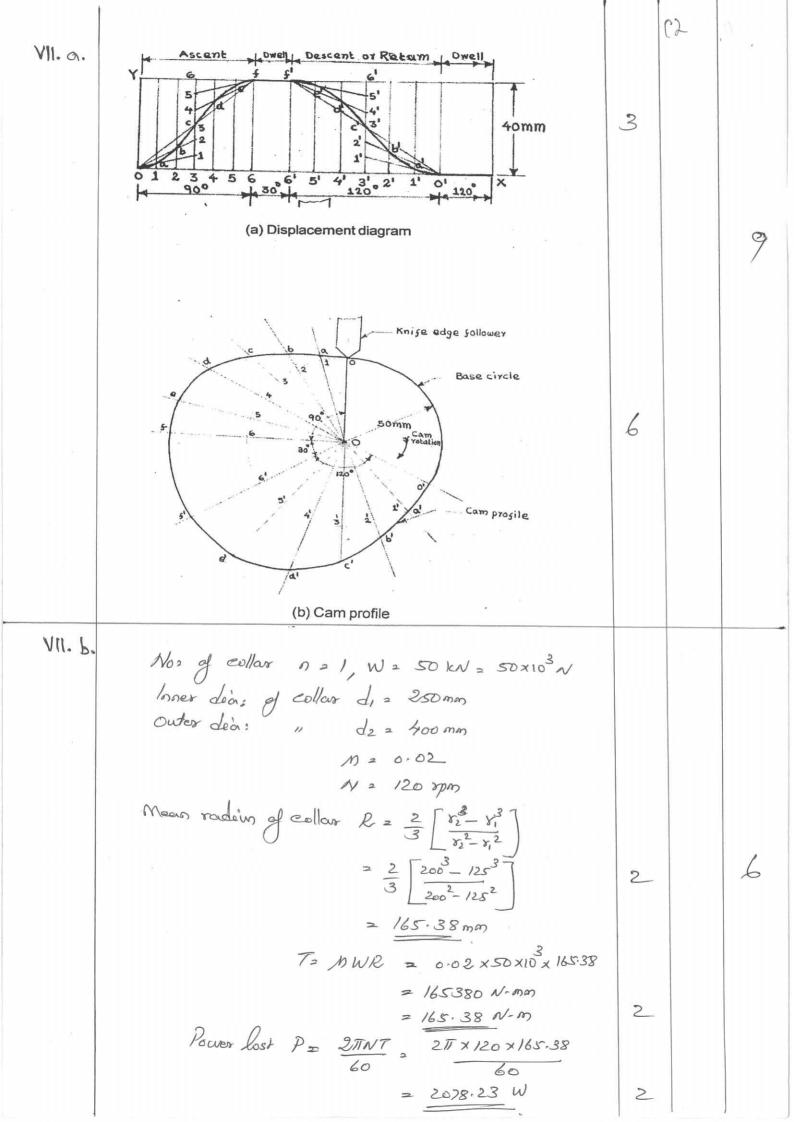
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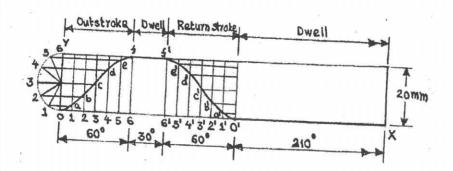
V.			m		
V. b.	To Tovisting moment ex torque, Noman	***		,	
	J2 Polar monent of cineration, month	- '			
	Z = Maximum sheer strem. MPa	30			
	8 2 roudius of shaft, mos				
	From Tossión equadión				
7	$\frac{7}{5} = \frac{2}{8}$	#/			
	$7_2 \leq 5$	6	. ,	6	
	J = TT (10 - di)		-		
	= 1/32 do (1-(do))				
(#)	= 1 do (1-k4)				
(i)	32				
	6 7 = = T do (1-14) 8= do,		21 1112		
	/2				
	7. = 11 Z do (1-k4)			K 1	
		-72			
	2 4 2 2 400 1 1 2 2 3 2 3 2 3 2 3 3 3 3 3 3 3 3 3 3	3			
				1	
- Y		6 Tilyes	n d		
,	and the second s	1.	Ú.,		
					\perp

VI.a. Tmax = 250 N-m = 250×10 N-mm Zs = 7 = 50 MPa. de 2 100 MPa. Th = 16 MPa. Design of shaft., That = 11 Zs d d = 3/16 Tmon
TT Zs = 13/TT x 50 3 2 29.42 mas etd Size, d = 30mm. Desjo of hub Inside dia de 30mm outside dea D = 2d = 60 mm Length L = 1-5d = 45mm 3 check the stren, = 16 Tman TID3 (1-k4) K= d = 30 = 05 = 16 x 250 x 103 TX 603x (1-0.54) = 6.29 N/mon² < peromisable value. Desja of key, 50° 22, so select squarekey W2 t = dy = 30 = 7.5 mm. 3 Legth lo L = 45 mm. cheeking shearing and enwhing strener. VI. b. — It should be capable of transmit torque — It should be permit easy connection and desconcerion of shafts.

— It should keep the perfect alegarest of trun shafts. 1/2 1/2×4 6 two shafts.

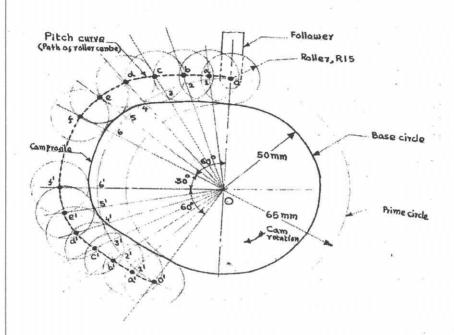
It should be safe from projecting parts.





3

(a) Displacement diagram



(b) Cam profile

Dia: of journel d = 200 mm = 3 = 200 ×10 m VIII. B Load W = 50 kN = 50 × 10 N N = 100 pm. M 2 0.02 Rubbing velocity 0 = TIdal = 11 × 200×10 × 100 2 1.05 m/s Heat generated Qg 2 MWV = 0.05 × 50×10 × 1.05 = 1050 W = 1.05 kw

IX.a.	Dia 1 of lenger pulley de = 450 mm = 450 × 10 m			
	" Smaller " de = 200 mm = 200 x10 m		, i	
	destance b/co pulley C = 1.95m			
20	Speed of layer pulley N2 = 200 your			
	Max. Jension in belt 7, = 1 kN = 1 x 10 3 N			
	M 2 0.25			
	Legth of enon belt $L = \frac{11}{2}(d_2+d_1) + 2c + (d_2+d_1)$			
±	L = 11 (450 + 200) + 2x1.95x10			
=	+ (450+200) 4x1-95x10	3		9
=	= 4975.18 mag			
	2 4-98m.			
	Angle of lap 0= 11 + 25:0-1 [d2+d1]			
1	2 180° + 2 Sin-1 450+200 2x1.95x103	3		
	2 199,19°			
Q.	= 199.19 x 11 = 3.48 rad		.1 45	
				8
3	Power transmetted P = T, (1- Ina) 11dw 60			
	$= 1 \times 10 \left[1 - \frac{1}{0.25 \times 3.48} \right] \pi \times 450$	-3 ×10 ×200		-
	= 2738.13 W	3		
	2.24 kW			

X.a. $ \frac{d_1 = 300 \text{mm}}{300 \text{mm}} $ $ \frac{N_1 = 200 \text{mm}}{300 \text{mm}} $ $ \frac{N_2 = 120 \text{mm}}{300 \text{mm}} $ $ \frac{N_2 = 120 \text{mm}}{300 \text{mm}} $ $ \frac{N_2 = 120 \text{mm}}{400 \text{mm}} $ $ \frac{N_2 = 120 \text{mm}}{40$	IX.b.			(0	
$A_{1} = 300 \text{ mm}$ $N_{1} = 200 \text{ ypm}$ $C = 3 \text{ m} = 3 \times 10 \text{ mm}$ $N_{2} = 120 \text{ ypm}$ $t = 5 \text{ mm}$ $Slap = S = S_{1} + S_{2}$ $= 3 + 3 = 6 \%$ $\frac{N_{2}}{N_{1}} = \frac{d_{1} + t}{d_{2} + t} \left(1 - \frac{S}{100}\right)$ $\frac{N_{2}}{N_{1}} = \frac{d_{1} + t}{d_{2} + t} \left(1 - \frac{S}{100}\right) \frac{N_{1}}{N_{2}} - t$ $d_{2} = \left(300 + S\right) \left(1 - \frac{6}{100}\right) \frac{200}{120} - S$ $= \frac{472 \cdot 83 \text{ mm}}{2} \cdot \frac{1}{4} \cdot \frac{1}{$		Addendum Circular pitch Tooth Tooth Width or space Cicarance File ratios Delendum Cicarance File Circular C	6		6
$N_{1} = 200 \text{ spm}$ $C = 3m = 3 \times 10 \text{ mm}$ $N_{2} = 120 \text{ spm}$ $t = 5 \text{ mm}$ $Slop S_{1} RS_{2} = 3\%$ $Total Slop = S_{2} S_{1} + S_{2}$ $= 3 + 3 = 6\%$ $\frac{N_{2}}{N_{1}} = \frac{d_{1} + t}{d_{2} + t} \left(1 - \frac{S}{100}\right)$ $dea: of 2^{nd} \text{ pulley } d_{2} = \left(\frac{d_{1} + t}{100}\right) \left(1 - \frac{S}{100}\right) \frac{N_{1}}{N_{2}} - t$ $d_{2} = \left(\frac{300 + S}{100}\right) \left(1 - \frac{6}{100}\right) \frac{200}{120} - 5$ $= \frac{472 \cdot 83 \text{ mm}}{2}$ $= \frac{472 \cdot 83 \text{ mm}}{2}$ $= \frac{72}{100} \left(\frac{472 \cdot 83 - 300}{4 \times 3 \times 10^{3}} + \frac{2}{100}\right)$ $= 7216 \cdot 45 \text{ mas}$	X.a.	de 2 300 mm			
$\frac{N_2}{M_1} = \frac{d_1 + t}{d_2 + t} \left(1 - \frac{S}{100} \right)$ $\frac{dea: of}{M_2} = \frac{2^{nd}}{2^{nd}} \text{ pulley } d_2 = \left(\frac{d_1 + t}{1 - \frac{S}{100}} \right) \frac{N_1}{N_2} - t$ $\frac{d_2}{d_2} = \left(\frac{300 + S}{100} \right) \left(1 - \frac{6}{100} \right) \frac{200}{120} - S$ $= \frac{472 \cdot 83 \text{ mm.}}{2}$ $\frac{d_2}{d_2} = \frac{1}{2} \left(\frac{d_2 + d_1}{2} \right) + 2e + \left(\frac{d_2 - d_1}{2} \right) \frac{d_2}{d_2}$ $= \frac{1}{2} \left(\frac{472 \cdot 83 - 300}{4 \times 3 \times 10^3} \right) + 2 \times 3 \times 10^3$ $= 7216 \cdot 45 \text{ man}$		N1 = 200 8pm C = 3m = 3x10 mm N2 = 120 8pm + = 5mm	*		
$\frac{N_2}{M_1} = \frac{d_1 + t}{d_2 + t} \left(1 - \frac{s}{400}\right)$ $\frac{dea: of 2^{nd} pulley d2 = \left(d_1 + t\right) \left(1 - \frac{s}{500}\right) \frac{N_1}{N_2} - t$ $\frac{d_2}{d_2} = \frac{\left(300 + s\right) \left(1 - \frac{6}{100}\right) \frac{200}{120} - s$ $= \frac{472 \cdot 83 \text{ mm}}{2}$ $\frac{472 \cdot 83 \text{ mm}}{2}$ $\frac{d_2}{d_2} = \frac{1}{2} \left(\frac{d_2 + d_1}{2}\right) + 2e + \left(\frac{d_2 - d_1}{4}\right)^2 + 2e + \left(d_2 - $	20	Total slep = S = S,+S2	1		
Legyth of belt $L = \frac{\pi}{2} (d_2 + d_1) + 2e + (d_2 - d_1)^2$ $= \frac{\pi}{2} (472.83 - 300) + 2 \times 3 \times 10^3 + 2 \times 3 \times 10^3$ = 7216.45 man		$\frac{N_2}{N_1} = \frac{d_1+t}{d_2+t} \left(1-\frac{5}{100}\right)$ $\frac{dea_2}{dea_2} = \frac{d_1+t}{d_2+t} \left(1-\frac{5}{100}\right) \frac{N_1}{N_2} - t$			9
Leagth of belt $L = \frac{\pi}{2}(d_2+d_1) + 2e + (d_2-d_1)^2$ $= \frac{\pi}{2}(472.83 - 300) + 2\times3\times10^3 + 2$ $= 7216.45$ man $4\times3\times10^3$		$d_2 = (300+5)(1-\frac{6}{100})\frac{200}{120}-5$,	G.	
$= \frac{\pi}{2} \left(472.83 - 300 \right) + 2 \times 3 \times 10^{3} + 2 $ $= 7216.45 \text{ man}$ $4 \times 3 \times 10^{3}$	j	= 472-83 mm.	7	7=	
$= 7216-45 \text{ man} $ $4x3 \times 10^{3}$		72			
4		(472.83-300)			
= 7.22 m		= 7216-45 man 4x3x103	4		
		= 7,22 m	/		

X.b.	1. No slip takes palace hence perfect VR			
	2. More compact than belt drive			
	3. It occupies less space			
	4. It can be used where exact movement is required.			
	5. No initial tension is required for its operation.			
	6. It is used with sprokets which are less costly than pulleys.	1	1 x 6	6
-	7. Less load on shafts compared to belt drive.			
	8. Un affected by temperature.			
	9. Possible to transmit power or motion to several shafts.			
	10. it can be employeed both for long or short centere distances.			
	11. It is more durable.			