

SWAMI VIVEKANANDA SCHOOL OF

ENGINEERING & TECHNOLOGY

LECTURE NOTE

MACHINE DESIGN

ER. ABHIJIT CHAND

Machine Desine of the P. and the for the part of the The subject mechine Desine is the creation of new machinels & improving the enisting one's. The Stop De marks the experies yeld Claffication of mechaine Desine man mole man O THE machine Desine may be Classified is AdAptive Desine. (11) Development Desine Desine in Stranger in the Barry have Concine as an in ADAPHRUE IN Diegine In Ind i) ADIAPHUE Desine in which there is no need of special knowlde on skilly. (4) The Desiner only makes mainer modepleation in the nexesting in the Produce 2011 non have 2001 2001 Survey in the Design Burger Burger of the Development Desine Min and the form of the second of i, Development Desine the type of Desine which needs scientifie traning Skill, & desine ability in orden to modefly the exenting with a new · 18 11 11 2 idea. (1) In this case the Desinen stant from the emiting Desine but the final produle quite different from the original one.

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Page No. priper lovid 1910918022 Date 1 /20 General Mostage prossiger machine IN M. Deserection at a fire the the the the The the state of t In Desineing of magnine component There is no fixed role. + The problem may ube shory in various way's but the Generical ProsiGer to Shorotime an Desine Aproblem is ag follow's. AND CHECKON - KING OF MANY Eneed/Aim/ h a. Lakies ija Synthesis Creenand 12 relate the support Analysis of force 1. TO LOOMER MALL VIELAN Naterial Sciention W. S. R. L.V. Design of Element's [modiffication] Detapied Drawing Production Recofication of meed make a complete statement of the Problem, indicating the needs AIM on ponpose for which the machine is to be Desinc.

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selectathe positione mechanism on group of mechanism when drive's the Deperty motion. Analysis of forces : Find the forces acting in each member in machine & the energy transmitted 1 reprisedent member 14 00 12x00 31 to make the process of Material Selection ? Select the material which is best sweetable for each member of mochene. AC ST ALL DOWN Desige of element's : VIX AF BIT find the size of each member of the machine by considering the fonce acting on the member's & the Permissi ble stress used.

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This means the material has Elastice Properties Dof to point B. 2 Syleid Dolat and a sum a comment After the point B the plastic stage start et noru so that beyound the Point B the straig incress fastin with increas in the strucss whith the in his point is religion at C NOT DIMONTO AND AND TON A At this point material its before the load And there is strein with and Phoness stress. Hence there are too greated point len Monog appen we wield poind & cower yield point WIT WORK BAR I ATOMIS BURRING rectimate stress At point D: the mind steel reaging Some strength and Higher value of striess are required for higher Strice of the stand of the stand without The Striess on cload the goes on Increasing the the point of is alsied. the Bridde Incress strong of the mild stem is follow with the uniform redsoution of ptis cross section of area . At point & the stress and such sen Attemper value which for In alterator de stress of the plan Y at the sponde the start parallele and string the and provention in production of the second

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Page No . Date : / /20 DE Know that stress produce in the steel BOUT 1651 ALES BY EG X GOUNT IN NE 2.CC The rotal load (p = PS + PC = BS XAS+62 surris no purprises 1 & Instar XAC IT A LO HEALDS IN A REAL FULLY & is it to Paula man Rold IR I have ACEON AISLES LEWISCH PREMODIFICIPE AND AND IN LOUGH DEERIPATIAS ES PC= PS AC ES De prest area NY 1-28 19 10 11 5185 10 619 . 046 17 PEPEPERPSILLAD PROPERTY STRAFT 1112 1 # RS HEED IN + POWER IS MANNING 1. VI 20 14383 CIN TRADER VI SCARENIE => PSR He teen pill 17383 1 1 1 1 A STATION IN MENDALLE CONT BR (HO EOCH) HASES) SA 1888 PS = P (ASES) ACEC + ASES) min stress (stress due to change when ever there is some increas or drepress in the temp of the body for cauly the body will enround on contract a little Consideration is so that if the Body Allow to expand & contrate freen with the ruse total of the temp proceens stregs are induge in a body.

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mathematical FID.S = marin Stress. Working/safestress No mallet malle set

DF the working stress of machine is 200 KN/m 8 the altimate stress of the machine is 450 KN/m² what is the Fo.s the machine

working Stress of the machine = 200 KN/h & the ultimate stress = 450 KN/m The F. D.S = cultimate stress working stress 450 KN/m2

200KM/m2

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Page No. 1202 Ch-2 Date. / /20 Design of IFastening Element's Jointo Dinton is the Process in ohich we file to more than to simplan on dement material by tempropary on parmanend Type's of joint. on Fastening 「「そのかい」、「、「、「、「、「」、「「」、「」、「、」、「、」、」、 The fastaning may be classified into too groppes & permanent i Fastening 1 2 tem Porpary y of Carity Mr. M. permanent Fastening The permanent are those fastening in which Can't be Barane ted with ocet a Damesing, the connecting materia on Comboned the sound in 2) 1 ? 1 日本語しているの時にしたし、10歳の Exis Soldening, "Brazing, rebating, welding ete · · · · 12 31 12 1 10 1 10 1 10 1 10 1 10 1 Temporary fastening Temporary fastening those fastening can be corporrated with out damazing the connected material or components. En- knote & bolt, Screed, key, spinds. st an it with

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bevel to von ce ondove instructo 1000 on both sples. Typels " i he is inter min and 1111 Square both Joint DL single v batt formt -> LEFT S MER MAN Single Moatt Joint. Dubbele v bott joint No. Cak Delbble u batt Joint 1 1 Nother With March 19 En Manager (RECEPTION CONTRACTOR 27,00,2022 Contraction And Contract Rebert Clopht is the Solut which is A permanent fornt reesed to connect to on more than to material's by with bebbet. This in Process & Renon as 50 Rebbet inc. The second second second second Thead is A CONTRACT OF A CONTRACT 17 Body Shank 1 16 11 16 i file side in 640 - 10 Tall al production of the second se IN IN DELO PLA . MUP share and the stand of the CUNT AN IN

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Dull 7 20 1 who a who had a friend D REMERST ASSA Daron Convesition, Supril 47 pro 6 % III carbon r. 2 % is stilling @ 12% al Bullher. 5 - 516 : Shuspheurs \$ 02. 1/2 5107 00 ANT AND CONTRACTOR AND AND In produce by proxiner by Rudding Funer Los offersor out offersor is have a property is noorethe ness primarity (Dole nord , porchistorioping alon wetting uil loced for the change renoin i realshook tracing pomerice isstruction Pipe public. over a sare prove det day when the Offeel the second first tates & avoy's of prop or carbon. Carton 1-5 1/0 , some amount of sillon Prog. Primey Life in Present int 1 19 81 4 1 3 X · · · · ST TYPE OF Steel TON HORAND P. Deed mild street of to 015 % (1) 100 (arbon on mild steel is 1.5% at 0.45 mendrum Courses Stepp 10.45 to 0.8% car HEOD Carbon stree 0.8 Vo 1:5 % cont Free cutting a lee 14 al 1 Free Cattling Steel anesus Phur & Phone Carbon oil to ory 110 - Scolpher 0.6.000 lead p. 05 to 10:2%

Tage No Date 1 200 Aller S Maril H CP Lori andory Alloy 2 is done for special Persona P. W. Markessing To Dance Progratance, Non Ton Repuisioner & to Raphave to Euchnical & mannitive per poties. cobality signifien, may sungstern a superior de l'anna and and HOOK'S (and rel) of the state of the Ditto in enosticimity in the the start of the s A DE PRIME . 2308 FE O SHA Wind the state of a back of the second of States and a state of the state - in the survey of a loss of a second I A NOT THE A CAME AND A MENT Card and the second and a state XI CAN DENISALIZATION . MORE PARTINE . . A A DISAME TAKE A DISAVE & CLAR MAR V DI VILLAN William La Constant 48 At and Pining set as an 2 Mar March

Page No. Mode's of Fallare /20) ay A starting lead reach a force which Stoducity orrelad de la mechanica / comroner system ashien does bld change with in moon founde & der lotten with respect to in the second we want the last in the and the second s (1) engineering noterilay to crossified to hi & GROUPS - BUDISISIY, DEPRICE NESS, (") The DurfiPty motoriol that is aluminium Stratule steel one have pretelevely high tenefie street before forcture in other without, A Brittle material that cost to from has a reletiable to a sensile strain before foctorie. F AND CHARLE MERCEN COR IN SE Three moderof failcines is protion fairings by electric The defence from by General Yleiding The former by General Yleiding factorizer. (1) fague by factoryter .. fairure not relective defelection the second >Y____ in application like transmitton shapen supporting Georges the manimum forces acting in the shared with out effecti

Page No . Date : / /20 Man ponformie nimited by the permits Rejabres clastife dereiletton (1) distrial or liersnonal there idty po consident as the constending of desine in such case s. ... y car in the all and a for the state of the second CPILIER by Greneria Miciding (i) to the mechanical companent mode off devotlifty moterial losses Pts Engineering use full ness' doie to' a "large amount of postic deformation after the yield point strieds in neached in the second (1) consideble porgon of the of the component Ri subjection to plastic / deferminen to caned Generical pickding in so 12 bo same show the bright a second 1 1 S Signed & and sold ton many start Ball XUSAL TO M min in the comparish med steers A SALISTIC BUT ON HOURS TO LESSIF (III) forfleine 3, bie 1, that apprinte component made off partitie material function sonthepoetony because of the Sundden faolor with ore plastice deperimition a (1)Warth Y' Bard

Paur No /20 Stress & shopp willopnom of cast Rom I win a bill and I I Land the second second 675 M. DIS MILL - I I W MILLY I I WI MILLY WILL 13 a fill a weather a fill a Mr. M. D. R.W. STREET al ul make (b) y PROPERTY AND THE PROPER United 11 Liber Human Mark Strain(E) Strain 140000 A PARTY OF in a capital a capital of the Lud To DAY Proper Sonol limite DA ERFRESS HOCKIS Down 14118 han as perpotional limite DI is defined as that stress at which the streng of strain conved begins to devote from slate line CALL TAT BUD SUN PORTA PORT ON Oltimote Streep land aning any the the speciman russian some Stress of higher value or stress one required for nigher strain than those britistion. A &B STI IN WATCH I WANT WIND 14 Million and States EVER THE THE PRET OF COLOREST. et all it W. S. S. B.

Page No. 18/101202 That 1 /20 Strength of Transverse fined / cap Soint weiding in a selection in the all WALLAS TAK Tis 4 2 All A A.K- Indiana is single transverse 1 1 welded Joint 11/101 11/101 S + B Let J = Throat thickness endy welding to The person demolaria length of high Potamoses The ALER P In I'm night Pothanous The perpendicular renorth of Edge weiding to the perpenducular length of high Potocnoces in the the interior Edge size of went i land 1 119 111 12/11/201 The Throught threeness (t) = SX Sin 450 Arrea of weld = LXT = Lx 0.7025 Rol 6+ = tensile ofress with this a statistic for the External force (P) P= 61 x 2 50- 707 5 for dubbile transver welding P=De 22 Gtlx0.7075

Date : 20, 10, 22 A plate loomm where so to mon think is to be elded to onother plate by mean's OF dobble panalles flifte The Mate one subject to static load or Boky Lon find the length of 1 the weld shear stree in the weld, doesn't omit 65 more Signa Land Jus read the provident of the the second second second Given a contraction wide = 100 mm , thickness 55 mpa real and the 1 BT @1,10,22 There is the poorte of the start B A Plate 100 mm wide 8 12 mm thich 13 to be olded to another plate by means or panallel 12 me plate ane subject 101 to 1 static load OF 8-50 km load find the length of weld shear stress in the weld idoesn't 50 mpg. first under state loading on Rathic Fatteret the set of the 19 set of the Given data -11 width = looming Anfex = 12.5 mm 10ad (1) = 50 KM = 50 × 103 N M 6 may = 56 MPR F 55 M/mm2 Bet it is the

114-14-124 icto meter meter mer moter implent meter moter intecto 11 190 - Elle And Merce cu3 nomotor data WY . KALOW 12 the first and the second second BOKN Cille Bo Stor Stores P= 6 mar x 2 x 0. 70 7 x SXL 50×103 0 55×2× 0.707×12.5×1 1. - 1 => (L) 1. 50× 103 55×2× 6, 707 ×12.5 ALL DA ALLAND LUDION Effectives = 581mm ceneth = 51+12.5 = 63.5 STORE STORE STORES STORES TRANSVERSE - Fluet weid 1011 man and the second 1) when the appeiled force is penpendealon to them length of the weld is called Transverse finet welt In this pinet weld consider the ALL simple a stress with grapping in 1 Samara · Abie with au) NOY NON 14. JOS Judi ONWAR 3

paralled Date Thansverse flued werd (1) when the oppered force is panalles to the tength is the weld is caued (1) In this parallel rillet Soind shear stress consider. (in) 0 in a serie same 54 1 - C - K - 1 - 0 - 1 In the static coad stress consede concentration factor is one that n Geraph means stress rentediver stress concentration factor Patigue load stress consectering concertration factor is R.7 That means effective stress = stress participation factor Complication of single fransvent and Parnale welding min A LA SUBTRINE HIS CORPORT OF THE UBLINE Why parnale finen weiding one occurre cause in tooside. because when we wending in 1 side The center of gravity is change in the one side then the plate and nemore around the conter of maulty .

Tade No Bult welding 28,10,200 /20 Loppint in the landaut + AM for the second () In the cap foint TP plane of the weiding of the two Plate not is called angle is good is called pap foint. an a plate is over i dring the other plate. (11)had in Bult Joint S. All S. S. K. NO SE QUID R i me plane of prate's by of Balt Soint is Same + it was and the bus (1) In Buit Joint two side of the plate ariel werding . B. . B. Nor Marie L' 13000 d'a suitable all ar title a (11) a war an a state of the all and Strength of the Bult (I DAR King in 1 Dia will Single Vir Bult

rage wo Date / /20 (y in But Soint the size of weld (s) = throat of three ness ((1) the state 1.58 in the list of the Lel's M PERSONAL STRUCTURE STRUCTURES and the Bill load caroled by Bult Joint f - Area y stress = = = + × × 6+ / 2 53 - 134 mon 1 + 100 Fie Aneon Xistness 1 1911 $\frac{(+,++)\times (-\times)}{(+,++)}$ A plate 75 pholder \$ 12.6mm thick I Solning in the another plate single transver joint & dobbie parallel Join! a os soon in figuene the manimum + trasfie & Shear Stress 70 mp \$ 56 mp Respectable. Find the length of the cach pontainen privet Soint is subject both statle & Palle Joint Given do to where = 75 mm throut thickness = 5=12:5 11. GA & ZOMPA - ZOM/mm Z ... 56 mpa - 56 Nmm2

errection intendity for Inansvence weld + 75 mm - 12.5 m 12.1 sille 2 · Bimmy ... ool lala A STATE FRANCE A MARCEN AND A STATE Let 10,200 h + + + E length of the Transverice well 1) 12 a kength of the parnote finef 1 320 N MORELE - LD Line MERLEYS Langth of the coch panne, staring load Now total load append the plate NOOD IPT Areax stress 11 175×12:52 70 = 656 25 M When the station is in the loss of the load of transvery used PIFAReal X Stregs - 6 8 2 · 5 × 12 · 5 × 70 1. 1211 001 01 546 87 0150 M2 11 load of parallel filled weld P2 = Anea x stress) < 1 . WX = 2 × L 2 × + × 56 -1.2×62×12.5× 56 Sarpis Pr HP2 2 1 1 2 6 5625N= 54658 + 1400 L2 and the second PI = Birload applied to the transver use Stries to Anon of Dell = 56 x C1 × 8. 7078 1= 70×62.5×0.707× 12.5 = 38 664.06 2 39 654 1/

Date: P2 - load applied to the randle filled weld. Total load (P) P = P, +P2 - 6 5625 - 38665 990 = 27.23 falloue length of weld for storie load Effective stress of transverse weld - 6t - 70 - 46.66 1 47 N/Mm2 1.5 1.5 Effective stress on panalled well = Z = 56 = 20.74 21 N/mm2 8.7 2.7 n = load applied to transverse - Stress × Areax ~ 47 x D 62.5 x0.707 x12.5 = 25960 2 25960 P2 = Good appelled topanallel weld - Stress X Area = 21 x 2 x 0+707 S X L 2 = 21×2×0.707×12.5×12 = 371.175 L2 Total Road P = Pit P2 12 - 605.65625 - 25960 371 12 = 160.97 ~ 167 mm erreptive length paravel werd = 107 + 12.5 = 119.5 mm - 120 mm

Based on "or river on plate river Marine Ma 11 800 1 Inderson William Sec. 16. 11 Lini 1 2 mar Bill 411 With sold wood have all all the single call Rivered 199 single but Joint Riveted Soint They is the song of the song o Having any and TA MILLION Y MARINE To an or property same 000 NO MEDIN Strap Bult Doleble Rivefed Goint. Still and Crminology Strent Alver (Mar) n = width or plate P = M d - d'aneter of rovet d = GV Friday Proposed The with the state of with the Compressive stress or (Creeshing Stres)

Pc : Stress X Anea - Go Mon y diot 9.1.9.2, 9.3 pl, 10.4, 10.6, 10.6 03111,2000 Q -Find the entitiency of the following nevented foint. A single revended lor foint of Grang Piatris with 20 mm diameter neverted having a pitch of somm IN DOBLE Revented Capingoint of a min Plate's with 20mm diameter nevert's having a pitch of 65 mm assume PERMISSIBILE tensile striess in plate 120 mpa Permissiable in revented equal to go mp Permissiable Crossing stress in revented 180 mpa: e te standa Given data Single riverted Lop Joint t = 6mm d = 20 mm P = 50mm 6+ = 120 mpa = 120 N/m2 2 = 00mpa = 010 N/m2 6 (= 180 MPa = 180 NIM2 0 70

Page No. Date / 120 In case of tensfie load - Stress X Arrep - 120 x (R=d) x+ ~ 120× (50 - 20)×6 1. 100 21600 N ALL STOP Y LE ALL ALL ALL in case of shear stress Ps B = ZXNXZd2 = 90 x 1 x (20)? 1 1 28274 M N. M. L. M. March 10 101 1 In case OF compressive stress Re = 6c XRXdxt = 180×1×20°×6 \$ 141 021600 M 01 - AMERICAN - MERINAL 1) = Stringth of Riverted soin for plate strength of an Riverted joint of Plate goint 1. J. C. 1. S. S. S. M. Y. J. S. C. Y. B. C. Y. 21600 120× 50×6 a lagro the market? Nor 1200 0.6 2 i sille and the Eppchenoy = 0.6 × 100 ~ GO %

1 11: 1. 31 TI TIL 0 1.111 0 0 1001 1. 1. 1. 1. CF. 1 Given doute 1 1 T. C. M. K. S. S. 11. 1= 65 mm 1 C = 20 mm () + 1 mo ()) of 10 1 6+ = 120 mpa: 120 N/m2 2 = go mpa = go N/m2 6C=180 mpa = 180 M/m2 o -terr will with the relient the in case on tensfie load あったい、シャントリードレイ いん、「の、「う」は、「やチンロー」 $r_{+-} = 6 + \chi (p-d) + \dots$ = 120 x (65-20) x6 - 32400 N in case of shear load P and the set

Page No. Date : / /20 Stroigh of the on neverted Joing 65×80 × 120 = 96800 M . . . Erriciency = strongth of Rivetediar plate form De plate foint TO 132400 601 1 1 1 1 1 1 4680 1 1) - - - - - - - - - - - - - - - - - An A dobble Revented dobble cover but foint In Plate 20mm thick is made with 20mm diameter 100 mm (P) the permisonable staten ane = tensple = 100 mpa, 100 mpg Bompa find the efficiency of joint taking taking the striangt of the riverted in dobbie age twise then the single sheap hear . 2 + 1 == 29 mm / P= 100 disalper dis B+ = 120 mpa = 120 N/m2 Z tridoo mpan = 10014/m2 6 C = 150 m Par = 150 N/m2 the of the state to state of the tenselle load pt in 6+ X(Red) Xit will and 120× (100-25) × 20 - 180000 N · Sheart Stress = 1 $P_{S} = \frac{z}{2} \frac{2 \times \pi \times 2}{2} \frac{\pi}{2} \frac{\pi}{2} \frac{\pi}{2} \frac{\pi}{2} \frac{2}{5} \frac{2}$ = 196349 N

Date: / /20 Compressive stress 10 Ge xrend x J = 1500 x 20% 35 x 30 5.0000 eppfclency : instruction of alverted boint stranget of an alvented sole 150000 120 x 100 x+ D = 0.625 × 100 (Ans/ at a war and an an an and a station of The angle and provide the state of 104, 04, 04, 2022 LAND THE AND A PATH HOUP LOAD A THORY Design of Boller Joint / The Bolier has a longitudinal joint ag wer as cincamperence. Joht The longitudino mo joint is used to joint to boin the end of the plate toget the required dometer of the bolier. 1) The circampertance Soint is eased to get required the length boller. longituding Bat Soint of a Boller . + = PD +1 (connosion allowance

Journ Page No. Date : / /20 Die Streng Pressure / Jaime Pressure fn Boileg D = Butenoal Dlameter on poller Sey St = Persons mortsable Little AL - receipt efficiency of laneithadonal - Martin Barrison Rote_ The Thekness of the balter sey should not be less than 7 mm , build in the station of the state Drythe thickness of the bailer sell is less than 7 100 x 11 Marth States States 18 BEARS Diameter hof stores Bonier. m in in DE the Smm 1 Margin - 15d d=6VF DF, + < 8 pt = Pc 0 0 0 0 0 0 0 0 0 pitch of the revent 3> mm which is the mark is been P = Ct toth and the tothe tothe - ANI - SA H - IM ON A Distance between Pb = 0.33P + 9.67d CZigzlo Pb - 2d -> Chain

The mees of the Balt Soint H. L to call 12 5 at (single court) $t_1 = 0.695$ $t_1 = 1.125$ (.P.d) (single cover all the matrix the matri41: 0.625 + P.d P-25 HI SOTE ((Inside , boulen) 05/11/22 mal 12 day (" EX- A Dobble riverted cap joint with zig ja Rearted Destan 1707 is to be Deven for 15 mm inform plates Assume 16+ = 80mpa 25= compa Oc = 120 mpa . State how the Solutioning Paul & Find the eppidence of foint ... - all market and the state of Го 0 0 6 + = 13 mm 6t - 80 mpo - 80 Mi/mm2 Z = GOMPA = GON/MM2 60 = 120 mpa = 120 M/ mm2 (1) there ness or Bold

Page No Diancter SEL TRue to US A Like ALL 01 = 22 mg 3) PItch of the new t's Pmax = Ct +41 = 2.62 / 13 49/ = 75.06 mm and the first of the Pt = (P-d) is to x 6t - (P-23) X13 X 80 A 1. Marker Marker Ps = (rxP.) x x x d 2 xZ =(7×2) × = ×(232×6 (DX2) x 24912. 49857 N and the state of t Pt = RECENCERENCE VP-23) ×13 ×80 1 = 49852 -)(P-23) = 49857 13×80 bild, hit was a with the P = 47.88 + 23 = 71 Pltchotribult = 71 mm Distance , 6: b/ p rows or river 4 Pb William Same = 0.33P+ 0.67d = 9:33 × 71 + 0.67 × 23 = 38.84 = 39 mm al 1 m the approximation of the second

5 mangine M = 1.5d -15×23-- 341. 5 mm P+ = (P=d) x + × 6+---- (71-23) XH3 X 80 49920 N Ps = (nr) x x x d2 x z = 2 x Z x 232 × 60 A V Station (State) = 401857 N $P_{C} = (n, n) \times (d p +) 6 C$ = 2×23×13×120 = 71760 4/11 0) Efficiency of relueted Joint 10 = least of Pt/Ps/PC PX+X64 - = 49857 71×13×80 9.4,9.5,9.6, 9.7, 9.8, 9.9

Page No Date : / /20 q. 2 Designe a Dabble reveled both Join t with 2 covered mater 100. for a langitudy nou seam of a boller shell 1.3 mellameter Sabsected to al steam prossure 0.95 N/Pmm2 Assame Joint enpiciency h 75% ollowable tensile stress in the plate go megapscal compressive stress 140 mpa & shear shress in the niverted 56 mpa to Given data tur DE15, = 1500 mm 1,) P=0.05 N/M2 01 = 75 % = 0.75 6+=90mPa=90N/mm2/8=140 1404/mm2/02=56N/m2/ Given datata anno sono is not is house thick ness of Plate : - 11) ants= PD . 41 2×6+×n: Kall A All = 0.95 × 1500 +1 (201) 11 2x 90 × 075 = 1107.5/0 mm Lalar the Million Later Line Line Dlameter of the reveted = 6,05 V7 1 21 = 6.05 V 12 = 20.018/2001 mm pftch = (p-d) + x p + 1 + 1 + 1 - (P-21) 0002 × 12 × 90 (P-21) * 1080 N

Page No . Date : / /20 Shearing strichoth on reverted $= Pr = (p \times r) \times p \times z d^2 \times z$ $\frac{1}{2} = \frac{1}{2} = \frac{1}$ Tellow or standard 125 1922 P-21 (2) Part 288792 1080 1080 38792 42/ 11/ 1/2 11/1/ 1080 . NOO 10 . 11 1 E BGC 91 - MMARINO. = 57 mm 11 10 pitch of mpueted 57 mm (Ans) The Transferrie Provention of the second second and Distance between nows of rivet (Pb) 50-33pt0.67d 1111 =0.33×57 +0.67×2 = 32.88 = 33 mm (Ans) Assame Chain dalve Pb=2d could be an meximal of the (Ans) 1 M I I W I WAY the kness of shappit F) +1 =0.6254 140 6 -0-6251×12-11-10 11 7.5 mm 7 10 (Ang month by more a fire hard of margin = 1.5×d in (bil) 09.1-1 MBX21 31.5 (Ang)

Date: / /20 The load of the foint BAS CHAPTERY dury Short's and key's 1/191, 202; a statistic a who was seen and a statistic to NO SULLAR STATISTICS AND AND PORT La state in the raise of the reader of the When we are an end of the set of the set of the moment of shaped 6 force x perpendicular alsistic offer him destance (N/m. momend of Mnersfalst=xull 21 11 Ob- Bending Stress (N/mm?) shaft Ba notational machine element which is nesed to tribansmitte power one place to another in milli The AUROPETION IN THE ET MILLER Function of short of 21 100 Mg ne power & deriver to the shared by some trangentection & resultand toon. Gonge (Twisting) moment set of with in the shared gransmite the power to the transfa to various mothere link of short. 1. (U) In order to transfer the power isbuft to another the worlding member such as a prenty gear el are mounted on it. These members anote with the fonces (w)encorted open them of cause the shaft to bending.

(iv)In other word, we may say that A shafted Per gesed to for the Arearsmissal Por lengue on bending moment. The varifoies memberily are mounted on the (N) shapted by means the key & splinge material cesed for the shalled i It should be high Strain. It should good machine ablility. (11) It should have low protent sensed Pulty nature It should be good heat tritement Perporty. (10) @ Dt should be high wear of right fance perpondy. (D) The material use for the shaft have in this penponty is nessacony. VI P P D WYC A the state for the state of the state. Type's of short t They are 2 Type of Shaft used by design in maening shart & rigit shart Transmine from shapp These shart transmite power between the source & the machinely power power The counter shaft the shaft wor over head shaft & old pactor shaft are trans mination shaft. Sence these shaft Capity machine stopp portuces as pulley gear etc. There fore They are subjusted to

Tage No. Pate : 7 /20 2) 12 bending in addition to tweestings Mus These shaps from moon Pherina, pand Bite machine pant die baank shapt 100, tam Shap NI BHE COUPTHE Maphine Shaft !!! MERSIA LICE DE LAN PROPERTY DE LE COM Design of Shaft o @ Consider twisting moment / Tongue -Time ZIDE CUE in block For Ria Crating Junithe production of the line THE IN MOLETING (1) XX: 13130 87 199 1 + For Part un transformer I man the She st NAT HERE 1 F 「アメノン師」の前にもしてして WE CHERRY VIG STORY đ the second second E But have all WE TOUR TRY OF SOUD V. Marin Marin 225 · 1933 =) = = ZXZ Add with a direction March alt vol ... ×2×2×2/ 32/6 SP VERICE XXXd7 -d - 2xxxdy 16×7

(Page No. 15,11,22 a consider it the persion in it is C 12 40 Lette Elasibilition d'in a streas 10 1010 (3) COMBINA MION OF TERSTON and Bonding and a spill and should be a Matter he down in a start which is the de F I (dord) 1 12 TR(do-d) X TX2 P=25LXMXT 32×1 GO d => I X (do d) XZ JF J & do 7-d, 9 E STOR WISH A line shape notating on loo Rpm is to transmite 20 kc) the shaped may be assume to be mande bonild steel Allowle Sheat Strees 42 mp determine the shape negliting the bending moment on the shape. 825 1 1 Given data MELOORPM . P = 20/KW = 20× 103 ØT = 20 × 10 3 × 60 2 2 2 2 2 2 2 100 1909.85 = 10/10 Mm mm List In The $\frac{d}{d} = \frac{3}{7} \frac{16 \times 1910}{7 \times 42} = 6.14$

Find the diameter ing solid shop to trans, 16,19,22 ROKE at 200 kly i the cutimate shear stress in HELSteel may be i laker, 360 mpa and the factor of safety is 6 . D. hollow Shill is to be used in Flace of the solled shape find the of the dianeter when the notic on perside on rad side diameter 0. Given data: 1 = 20 KW = 20×103 W N 200 RPM Wilmate Stear stress = 360 mPa Solution : 360 M/mm2 alreable shear stress 2 = celtimates stress F.O.S 2 - 3601 = 45 N/Mm2 8 51 5 11 10 power (P) = 22NXT :00 30 × 103 - 2× 7× 200× 5 Go 7 = 20×103×60 2×32 200 - 954.92 Say 955 Mr mm Soild Shape Dlameter of shaft = d = 3/16/17 = 4.76 mm 25×45 = 5 mm

For house preinder shaft A the second second second 0. 5 AB/ 10 XI ALS 11 A MAN TO MAND & SGI- (10-10.98 12 - 12) M A HYARGLE SMA LLL in the second way and the second second di = kux de l' pige sel in a 1 the C. 5 X 5 march WY & Los = 2.5 mm al side Shaft Scelected to bending $\Rightarrow \mathbb{R} = \frac{1}{6b}$ in whith whe => = xd1 = d => xxd1 = d => xxd3 = 1 => = 2x65 = 69xm 2x65 = 32xm 65 = 3 32 × m = (32×m)/3 TX65 TX64 (CA) -211 for hollow shafted M - Gb T X (de⁴-di¹) de R m= 65 x2 x.7 x (do 4-d, 4) $= \frac{66 \times \pi}{32} \times \left(\frac{do^{4} - di^{4}}{do} \right)$ $M = \frac{\pi \chi_{Gb}}{32} \times \frac{d\sigma'}{d\sigma} \begin{cases} 1 - (dr) & \gamma' \\ \frac{d\sigma'}{d\sigma} \end{cases}$ 2×65 × do3 > C1- Ky 32

THE REAL MERICES IN THE do = 3/ 32 xm = x 66x(1-K)4 / 1 14.4 A pair of wheel of a tralico water caret. A load's of bo KN all each cent bor. Acing it a disdance toomy out side the tohoot boen The gauge of the riait 15 mm Pind the ding of early belowcen the wheel it the strew. not to amps loompa Given data mineration with production of F = 50 KM = 50 × 103 M - 10 11 L= 19m = 1.4 × 103 mm 6b = 100mpar = 100 mm2 11 101 11 Charles The Area Formation Construction m = Porce x 1 distance = 50×103×100 5× to Enymm - 79.85 say (1N3) 80 4 50 50 24 191 iter I plat iter Carlore Parch & -1

(Page No. 17,11,22 Date 1 150 Shaft subjected both Honson & Bending magismen & shear stress Zmax = + V(6b) + (42) due la tonsform manufmain norconal Stress 66 = 106+1 (66)27422 Bending moment <u>m</u> = <u>6b</u> <u>P</u> - <u>Z</u> => Ob = MXX UN H 8051 4 11/11/2 B I CONTRACT AND EX 6b) = mxdia ay xdy $h = m x dx 6432 \rightarrow 6b = m x 32$ Tongon equilion Tratize Torson equipon = 2 = Z = TXM = Z = TX = IX d 1 32 $2 = \frac{16\Gamma}{1 \times d^3}$ 50 The

0

Emax = 1 (6b)? + 422 $= \frac{1}{2} N S \left(\frac{32m}{3d^2} \right)^2 + \left(4 \times \frac{16T}{5d^3} \right) m$ #1 1× 1× 1 2 mare => 6 mage + 1 6b + V = (0b) = 1 422 $=\frac{1}{2}$ × $\frac{82}{33}$ + $\frac{1}{3}$ ($\frac{32m}{33}$) + $\frac{16T}{13}$ $= \frac{16m}{1d^3} + \frac{16}{1d^3} \sqrt{m^2 + 7^2}$ (6b) max $\frac{16}{3d3}$ $m + \gamma m^2 + T^2$

A shapt made off mpid steel is neguine to transmite locked at 300 KPM. The support ted ichouth on the shart is smill carry to pair to each walting 1500 mg. supported Atta dus-Joince or in from the end Respectable. Assumering the safe while or Stress. 1500M 1500M M- BOORPM & N= 100 KW = 100 × 103 W 3m $L = SM = 3 \times 10^{3} \text{ mm}$ We know that p= 22 NT 60 => 100 × 103 = 27× 300 × 1 = 100 × 103 × 60 25 × 300 manimum Bending moment · at Cib m = 1500 % 100 ~ 15×105 MM Equivalent Tongae formuly TX 83x2 =Vm2 FT2 f Assume 12 = 60 M/mm? X x d 3 x 60 = 1 m2+T2 = J x d 3 x 60 = V (15x105/2 + (3183)2 -[15×105 mm)+(3183×4)3 - 3518.7 × 203 Minny ~ 351 9 × 103 M/ mb

d = 3/ 15×105×10 XX60 = 66.87 Day 64 (H.) A 240 RPM: determind, the dramedare of the shape If the manimum dongood fransmited enced A man tongale by 20 yourake the moniment Allable shear stress Edge Gompa. The a share of a stand of a second Given data A CONTRACT OF A CONTRACTOR $P = 1 \text{ mw} = 1 \times 10^6 \text{ w}$ $M = 240 R \cdot P \cdot m$ Imany = 20 % Imean $= \frac{20}{100} \times \text{Tmean}$ $= 0.2 \times \text{Tmean}$ Z = 60 mpa = 60 to N/MmR We known that P= 2XMXI => Pmean = PX60 60 2XM => 1×106×60 => 39788.73 M.M. 7 39782 73104 mm ? ... Tman - make the first = 0.2 × 30178872 × 103 - 7957746 $d = \frac{137}{712}$ T & 16x7487746 TDS 1 15-1 857 - 74 mm

342, 9, 143-517, 308-99 J.A. V 21,11,202.3 Keyrs and and P. M. t. g. C A ver is a ricce of mild steer insent beicher the shafe shake on , Boys or A rully to connected there type then in order to privent incretive metion, bedoen them to a six with 18.4 1 1 1 X State Date & Marthan 2 Mar It is alway's in sensed paralled to the anis to the "shaft and in it is is 1. The server of a second first. Runchion of Kenys (Kenys (Key's one closed to temperiony Fastering & subjected to consider atle crossing & shearing stress. The key wey is a state out recessing as Shoft Shab of the Pully to accomode to A Key al Prince A The Following typels of key Important B Sunk Key (5) Round Key (B) So ddle (Key (G) Sprines (3) Topper Ker (y) Tongent Ker Tote In shearing the stress the key are failur in case of chushing stress the staff note

Page No Date : / /20 Scink Rep. Kery i Rectangular Sunk Kopey (2) Square Sunk Kpey (3) Panalled Sunk Kor Key (4) Gib - head sunt top key feathan sun 2 by Rectangular Sunt De 10) 4ml NUMBER OF STREET i (anter a transferrar) in in many puties de man Brand 2021 273 T = C ×111120200 As and prove to do FOR WILL ALL MADE VING 1. Mr. . 188 2) Square dunk kyc5 D=t=g Tugen stur 1 11 years where a get a get a state of the second of the Parpared seek key may be of rentain gular & squar sealtion uniform in width 8 thick ness throught and with When all a series in the series in all It may be noted that A panalled tappen less & is cesta where the pump sean on other menting pleie is Required to the silde along the sharpf's. 11 . 1 . 112

Gib + head Sank key 1 1 La Mar al Carlo Supper Jupper (C.211 .1: 100 The sum of the 11-1 - M Mart 11-68 131 DEFT 11- 1 A Key Attached members of Any Pain & while E. Pormit relative only moment is non as prosted Scent Key" () Dt is precion type of pornal key a turing moment & also permit also onia) memory moment 1914 is postened either to the shapt & hub to the key baing Slyding Peed in the bey way of the moving riece . 22,11,22 Type's of seddle key flate saddle key pt prove A Flate saddle key is a prapper RE which is fit in a key way in the hole and the plater on the saft . 1/2011 The chip which the the phase we are an and the second and t "> It is intery to slip round the shart ander load merce for it is used to comparately life reload and 11 -11 11 11 11 Hole soddle Key is a fappen key which fly In a keyway on the help and the bottom of the

Page No Date / /20 key save 2 red they convert sourcase: Tongent Key 5 A Tangent key are the fitted in pain in white angle is key to with stand Attoson in one direction only mest are used large heavy duttes shaft. and a set of the set of the A CONTRACTOR OF A DECK St. Charles Round Key when it is a straight A Round Key , our Concellar Sichos Section & Pit into honow drifted party in the shaft & Pant within the habit with all A LE STATE AND A STATE Spinesu in and and in the Key's are made integray with the Shart which feel in the ph the hub such shoft is known as splineled shopt 1 M B BACK JAPA D= 1.12.5d 10 10 10 10/9 bo, E. P. B. B. D. W. B. Gus Angel M. pre cot a contrate to be for Design of key in will 1 tongue Fonces distance 15 GCPLX+Xd

2 X W K GC Y to be feet RW KIGE 1 + 111 Z = 10 = 60The second of the second TETT REPART X YOU HUL HU R- 132 ZXXXXXXZ - CXXXXX -32×2 16 CARTINE KAR GEREN MARKEN IN Design a Rentigolar Keny for a Shaft or scrind ether shearing -, creishing Stress For the king maderial are ye mpa, 70 mm FLOT INTENEND MOTOR Réadanoisian keying print find the C = Bomm Z= = 42 mpo = 42 mp2 SE = 70 mpa = 70 Ny/mm Rectangulant Keignissen lipt WE WE 16 Shearing Strength (Psylin all XLIX 2) = 10x6x42 2671 L Shearing Torque - Psxd = 672×25 = 1690 L N-M

TELEVIE DE 22 XUTI DE XUZX 2 42 x X (30)3 (2 4030 8 33 1. 080 301 13. 11 10 2 11 16 11 1 261 1 680833 11 1 11 1 1 A. MATHE Same Same Spect Photos 1116800 L MAROSSELLA LANTE 1030 BOSTINE GIN BELLEGIMM THE REAL TO BE TO BE THE THE 191 Creashing strength (Re) = 10 x + x 62 1 + 10 - 76 121 12 13 5600M - C K 5 X 70 = 357 Crowhing Thorque' = 3500kd 1111- Ky · · illour de suissignité 87500 = 1030833 1 - D - D = MORD 835 DETER YEARE (D) · 223 01 8750 1200 201000 1 1 2 1 10 × 1/17 . 280 mm = 118 mm 2 2 1 the second states of the second states Effect of key ways in the · 1.0 Sauges Lucit Harves burne & white Billing · RE 1-0-21 (0) -11 · 1(b) 1/2 · 10/10 · 0) Cit effor plactor shart strength factor is if if the Consedence flog without the key way's curved of shapt lode cannot capasity of the shart . I) This is due to stress Conseder for neatime Conner key way & the readuction cross section of the shaft.