· ASTM

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Mariner Edition for Beart deliars 1200 - 1245
* Tanker calculation.
· we need density for knowing the volume
122000
to a calibration take: we get volume of the purity
with respect to the
. weight = volume x density
Temp. 1: weight == volume 1 x density
Temp. 1; weight = volume 1 x density 1
· to in case of the duty cargo it is mendered been carried
· Unit of weight
Metric Ton, long Tons, Short Tons
· ASTM Table 56 - provides for converting weight in vaccum to weight in air.
· Ullage report: · Tank No.
· Observed wage - from UTI tape
· Corrected allage - We ust correction from stabilty booklet
· Temperature - from UTI
• Total observed volume • (TOV) - including free water
· Standard volume · Ciross observed volume (Ciov) - only oil after deducting of fre
Density margaren at 25°C = 0.9155 Vensity at observed temp.
weight (MT)
This mean that,
Density at 31°c would be = 0.9119 (temperature 1, density 4)
" " 32°C " " = 0.9113 200 21 31111 1 1041 000
" " 34'C " " = 0.9101 " ", 911'3"
" " 35°C " " = 0.9095 " ", SU" ",
" " 20°C " " = 0.9185 (temperature +, density 1)
dini o
· VCF (volume correction factor)
· 1 barrel = 0.159 m³
$1 \text{ m}^3 = 6.29 \text{ barrel}$
· API - American petroleum institude

American society for testing and materials.



3)

· ATSM Table 54(0) - crude oil product 2 VCF table in m3, temp-oc
54(b) - petroleum product
6(a) - crude oil product & vcf table in barrels, temp- of
6(b) - potroleum product
Temple 0.810 0.812 0.814 0.816 - Density @ 15°c
32.5 0.9841 0.9841 0.9842 0.9843
34.0 0.9827 0.9828 0.9829 0.9830
35.5 0.9813 0.9814 0.9815 Add D.9816
The state of the s
At 34°C (mean temp. of three level in tank) & at density at 15°C is 0.816,
we have 500 m3 vowme of oil in tank
- comparing from is 0.9830
So, final volume in unage report at 15°C = 500 x 0.9830 = 491.5 m ³
So fina vocane in empe
· Density in air & in vaccum
Density in air = Density in vacuum -0.0011 Oisc Oisc
we call this as a weight correction factor (wcf).
THE WAS TO SEE THE PARTY OF AND LOSSY TO THE WAS A SECTION OF THE PARTY OF THE PART
· Example:
Density in air = 0.816 - 0.0011
or, wer = 0.8149
UKe, GSV = 13993.149
$\omega CF = 0.8149$
weight (MT) in air = 11403.017 mt
· volume & temperature conversion
· US barrels & cubic meter
1 Us barrels = 6.2898 X cubic meter
· °C to °F
$9eg F = 1.80 \times 9eg C + 32$
Jeg r - 10 / 1



· ASTM Table 9 - To get the WCF to convert borrels at 60°F to short tons	Rate o
· ASTM Table 11 = 70 get the WCF to convert barrels at 60°F to long tons in the	56277
· ASTM Table 13: To get the wcf to convert barrels at 60°F to metric tons in	
vce the air	
Volume (m3) Table 54(b) \rightarrow Volume (m3) Table 56 weight in MT	
@ Obs temp @15°C	There
VCF, OTEP 3] PORES BERE WCF 1886 0	
· volume (bbb) Table 6(b) > volume (bbb) Table 13 > weight in MT	
(obs. temp weight (why ton)	
weight (short ton)	Ques 2 :-
Toble 86 (Products)	
Weight were (bbu) were weight (box ton)	
(Short ton) (Short ton)	THE STATE OF THE S
COSSE AND THE RESERVE OF THE PROPERTY OF THE P	
DEASIBLE TO DIE = DEASIBLE TOOL	
(weight in Mal)	Som
16/02/2022 (1301) 10/15 noissert of the present wage is 1.6m. The	
Ques: A tank has an area of 75 m² and its present ulage is 1.6 m. The	
tank is being filled through a pipe of diameter 200 mm: calculate	
for how much longer the tank value should be left open to	
Obtain an whage of 800mm. C+18:0 - 4365 10	
Average rate of flow through pipe is 1.75 m/ sec.	_
Soin:- Present mage: 1.6m (+180	
- Final whage: 018m+10. Eath = com (111) while	
Cargo filled: 0.8 m	
Volume of cargo filled = 0.8 x Area 30050 5000 35 300000	
= 0.8 X 75	
1319F Gorm3 X 8841 A Warned 201	1
Dia of sing = 200m = 0.2m	
110 of pipe = 200111 = 0 2111	



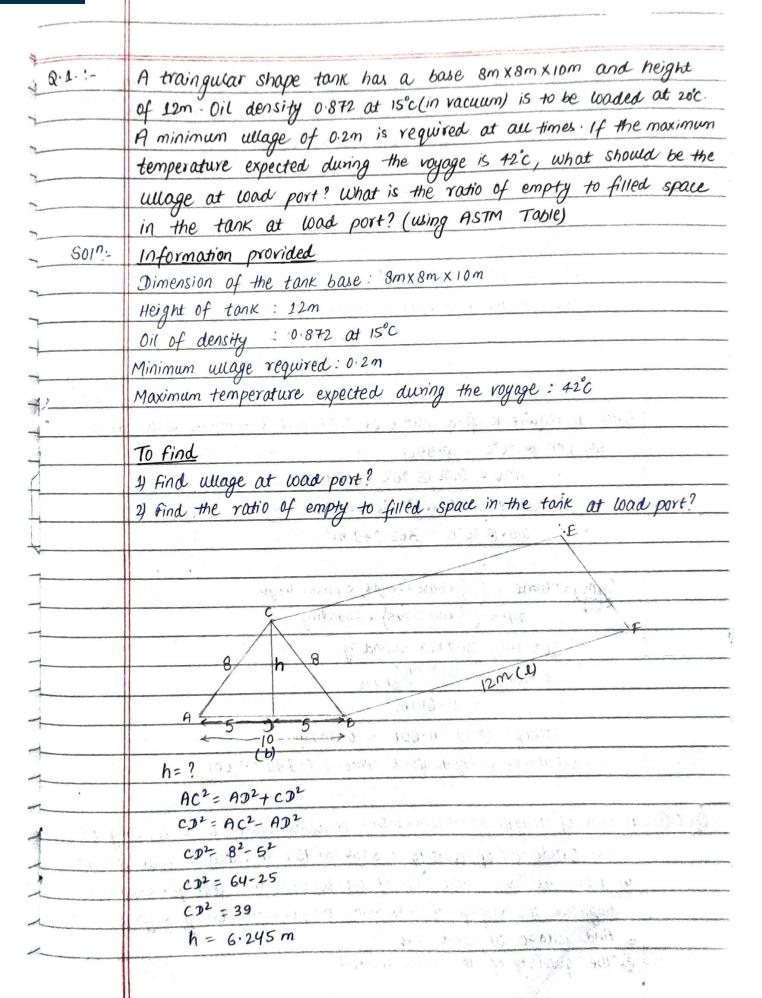
$\pi r^2 h$	
Rate of flow through pipe is 22 x 2 x h(1)	
The state of the s	
= 22 _x 0.1x0.1x1.75	
7	
$= 0.055 \text{m}^3/\text{sec}$	
Therefore Since, 0.055 m3 oil enters tank per second	1 60 m3 should take
total accust all consenses time 60%.055 =	1090.90909 seconds
	18 Min 10-9 seconds.
Stage	v g sin V i
Ques 2:- A box shaped tank has L=20m, B=15m &	D=10m is being
loaded through a pipe of diameter 300 mm a	ind length 5 KM.
2 percent of the volume of the tank is to be	e left for expansion
Calculate at what unage the pumping has	to be stopped in ord
to accompdate all the oil in the pipe line.	
Cargo temp. is 27°C & the RD of the oil is o	8535 t/m3@ 15°c,
and change in density is @ 0.0006/degc.	· · · · · · · · · · · · · · · · · · ·
2 15 110 - 2000 m3	
• Pipe dia = 300mm = 0.3m Pipe radius = $\frac{d}{2} = \frac{0.3}{2} = 0.15 m$	
Pipe length = 5 Km = 5000m	
Volume of pipeline = Tr2h	:2.5Hm ³
$= \frac{22}{7} \times 0.15 \times 0.15 \times 5000 = 35$	
Mass of oil that can accompdate in the pit	1°C = 0.0006
= Vol. x density	12°C = 0.0072
= 353.5 Hx 0.8463	Temp 1, density 1
= 299·227 t	0.8535-0.0072 = 0.8463 t/m3
• 2.1. of vol. of tank = $3000 \times \frac{2}{100} = 60 \text{ m}^3$ to be left	for expansion
volume of oil to load = 3000 - 60 = 2940 m3	
Mass of oil to wad = rol. x density	
= 2940 × 0.8463	
= 2488·122 t	





	-
· Mass of oil at which wading has to stop	1
= Mass of oil to load - Mass of oil that can accompate in pipeine	7
= 2488.122 - 299.227	_
= 2188·895 t	_
· Mass = vol. x density	_
2188.895 = (20x15xb)x 0.8463	
2586.429 = 20x15xh	_
At h = 8.621 m sounding, we have to stop wading.	_
· Ullage at which we have to stop loading oil	
= 10-8.621	_
$= 1.379 \text{M}_{\odot} \text{Mag} \text{M}_{\odot} \text$	_
The first of the second of the second state of the second state of the second s	-1×1-
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	~







1000	volume of oil that can be waded Note: min wage oznis required: Soman. we can wood is iz-0.2 = 11.8m
s ())	= / 1x base x height x prism length we con wod is
	$= \left(\frac{1}{2} \times 10 \times 6.245\right) \times 11.8$
V.) 3	
	$= 368.455 \text{m}^3$
	volume at max ^m sounding = 368.455 m ³
	Chov @ 42°C = 368.455 m3
	VCF @ 42°C = 0.9793 (Page-25 of Table 54, density - 0.8720 t/m3 at 15°C, obs. temp. 42°C)
	Chross standard volume, USV = C10V@ 42°C X VCF@ 42°C
	= 368.455 × 0.9793
	$= 360,828 \text{m}^3$
	this is max volume of cargo which we can load which will not even trouve me at 42° aung voyage.
	Since I require to find ullage at wad nort e temp at wad nort is now
	SO, VCF @ 20°C = 0.9961 (Page 24, Table 54 density - 0.8720 t/m3 at 15°C, Obs. temp. 20°C)
	Chsv = Gov@ 20°c xvcf@ 20°c
1	360.828 = GOV@20°CX0-9961
	$600^{\circ} = 362.241 \text{m}^3$
	(GOV) volume = ('1xbasexheight) x prism length
	362. 241 = (1 x10×6.245) x sounding
	362. 241 = 31.225 x Sounding
	Sounding = 362.241/31.225
	= 11.601m
	Ullage > 12-11.601 = 0.399 m
	Ratio of empty to filled space > 0.399:11.601
	A(3-103+103)
ນ _ີ 2:	
	A tank of length 32mx18mx11.5m contains water to a sounding of
	10 cms crude oil of density 0.8350 at 15°c in vacuum was waded
	in tank at 25°C, also 31. of oil loaded was left for expansion
	throughout the voyage of maximum temperature during voyage is 34°C @ Find usage at load port @ The quantity of the cargo waded.
	(c) find ullage at waa port



	-		
*			
required Somano		Total tank sounding: 11.5m	x 1
we can wad is 12-0.2 = 11.8m		water : 0.1 m (10cm)	
T GM		Empty space for loading: 11.4m Vol. of tank available for loading: 32x18x11.4 = 6566.4	m ³
		3.1. of oil to be left for expansion: 6566.4x3 = (-)196.9.	$92 m^3$
		37.00 011 10 00 (2) 1 10.00	
		6566.4 = 1.03 V	V =
1		$V = 6375.146 \mathrm{m}^3$	
emp. 42°c)		Maxm volume amowed even - 6275, 146 m3	
31, 12,		at maxima vogage	
		$VCF @ 34^{\circ}C = 63+5 \cdot 146 \cdot 11$ $VCF @ 34^{\circ}C = 0.9843$ (density -0.8350 t/m³ at 15°C/C	bs.temp-34°C)
		Chross standard volume usv = Gov@ 34°C XVCF@ 34°C	0
can wad		= 6375.196 X 0.9843	
2°c during voyage	-	= 6275:056 m ³	
d port is 20°c		Since I measure to find whose at was port & temp at was part is 25°c	120
oc)		VCF@ 25°C = 0.9917	
Te de la constant de		65v = 60v @ 25°C X VCF @ 25°C	
• (1)		6275. 056 = GOV @ 25°C X 0.9917	
		400 @ 25°C = 6327,575 m3 = pale of the parties	
	(a)	volume of oil + volume of water = 1xbxh	
	رسي	6327.575 + (32×18×0.1) = 32×18×h	n. 3,
		6327.675+57.6 = B2X18Xh	to satultes
1		6385·175 = 32×18×h	Ten Canel
		115085 - 16 31.26	
		8+1 Mage > 11.5 - 41.085 = 0.415	
	(b)	Quanity of cargo waded = GSVX density of oil at 15°C in	Air
A	(-)	Density in air = Density in vaccum -0.0011	100
Squading of		= 0.8350 -0.00m	5.44
sounding of		= 0.8339	
was loaded		Quantity of cargo wad = x6275,056 x 0.8339	
voyage is 34°c		m 1 = 5232. 769 tund	
0.10		Unage = 16-15-762 = 0-238	
		Final allow if allowe never is in above deck - 1+0 258	
1		0.86210	



2022		
62:03 2022		
	A rectangular tank 35x21x16 is to be waded with crude oil at a	
	temperature of 25°C. It is desired to leave 3% of tank volume for expansion.	
	Calculate the quantity of oil waded and final wage at wad port if	
- 1	ulage point is em above deck. Also calculate whage when temperature	
	rises to 44°c (density of oil 0.8475)?	
Soin:	₱ Total voim of tank: 35×21×16 = 11760 m3	
	3.1. to be left for expansion: 11760 x = (+352.8 m3	
	Volume of oil we can wad = 11407.2 m3	
	Crov @ 25°c: 11407.2m3	\parallel
	VCF @ 25°C : 0.9919 (density = 0.8475)	#
	CASV = CHOV @ 25°C X VCF @ 25°C	#
	= 11407.2 × 0.9919	+
	= 11314.802 m ³	+
@	Quantity of oil loaded = GSVX density of oil at 15°C in air	+
	Density in air = Density in vaccum - 0.0011	+
<i>y</i> .	= 0.8475-0.0011	#
	= 0.8464 t/m3 . 5 vars = 320 .21 28	+
	Quantity of oil waded = 11314,802 x 0.8464	#
	(100 0) - 117 9576.848t + 110 to 20010	+
<u> </u>	(nor @ road temp) volume = area x sounding = 120	+
Ullage a	11407.2 = (35x21) x sounding + 6+3 + 8 = 3	#
load port	sounding = 15-52m extens	+
	ullage > 16-15.52 = 0.48m	#
	final unage if unage point is 1m above deck >1+0:148 = 1.480m	+
<u>C</u>	(0 SV - 600V @ 44° X V/C @ 44° A	+
unage at	11314.802 = GOV @ 44°C X0.9767 GOV @ 44° C = 11504, 721 m3	+
44°C	11367 72611	+
	(Gova Volume = area x sounding	+
	11584.726 = (35×21) x sounding to 11+100150	#
	Sounding = 15.762m	#
	U11 age = 16-15.762 = 0.238	#
	final whage if whage point is Im above deck = 1+0.238	-
	$= 1.238 \mathrm{m}$	11



Smart Mariner Edition for swart saliors	Previous year paper solution	
	Tanker Calculation	-
Apr. 22 ①	Total vol. of tank: 21 × 16 × 16 = 5376 m3	Dec 21
	2.1. of vol. to be left for: $5376 \times \frac{2}{100} = (-1)107.52 \text{ m}^3$	
1	expected is 20°C Volume of Dil we can load = 5268.48 m3	
similiar:	Note: - we will load considering 40°c, bcz in voucae we will get 40°c	
Jan 22 ~ Nov 24	(40) (0) 4000 5000 3	
July 21, Mar 21, dec 20, oct 20,	VCF @ 40°C = 0.9785	
NOV 19, JULY 19, NOV 17	asv = GDV@ 40°C x vcf@ 40°C	
Y.	= 5268.48 × 0.9785	
	$= 5155.208 \text{m}^3$	
VIN	@ Mass of oil loaded = GSVX density of oil at 15°c in air	
r,N	Density in air - Pensity in vacuum - 0.0011	
YK	= 0.820 - D.0011	
	= 0.8189	
	Quantity of oil waded = 5155.208 x 0.8189	
(%)	= 4221.6 t	
	1 Ullage at load port	
9	Note: At load part, it is 24°c; we are loading in taking into account 40°c, so current ullege	
	will be less; hence we make calculation by taking 24°c	
	C7SV = C70V @ 24°C X VCF @ 24°C	
	5155.208 = GOV @ 24°C X 0.9923	
4	C70V @ 24°C = 5195.211 m3	
	(Gov e) volume = areax sounding	
	5195.211 = (21×16) × sounding	
-	sounding = 5195.211	
	21×16	
,	sounding = 15.462 m	
	Ullage = 16 - 15.462 = 0.538 m	
	Final wage if whage point is 0.8m above deck	
	= 0.8 + 0.538	
	$= [1.338 \mathrm{m}]$	
Peb 22, 2	Sol ⁿ is in Page-53,54	
Aug 21, Jan 18		



3	Total vol. of tank: 30x18x20 = 10,800 m3
	(a minimum wage of 3.5m is to be maintained during the voy. at max temp 37°c)
	volume of oil we can wad = 30×18× (20-3.5)
	m to 2000 = 30 X18 X 16:50
	$P = 8,910 \text{ m}^3$
	GOV @ 37°C = 18910 m3
	(0.8250) VCF @ 37°C = 0.9813
	C7SV = C7OV @ 37°C X VCF @ 37°C
	13 01 22 12 3 10 12 8910 x 0. 9813 3 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	= 8743.383 m3
	@ Mass of oil waded =?
	Density in air - Density in vaccium + DHODIL
	According 0. + 0250 + 0. + 0. + 0. + 0. + 0. + 0. + 0.
	+ 80+ 0885==0.8239110 to philips
	Quantity of oil loaded = 8743.383 x 0.8239
	7203,673 th
	(b) Ullage at wad port = ? 121) = 80 F 868.5
	CASV = CAOV @ 26°C X VCF @ 26°C
	8743.383 = 40v @ 26°C X 0.9907 10 00010 0
	CHOV @ 26°C = 1 8825. 460 m3
	(@26°c) volume = areax sounding
	8825.460 = (30x18) x sounding
	sounding = 16.343 m
	Ullage = 20 (16/343) = 3.657m
	@ vilage, if temp unexpectedly rises to 45°0 = ?
	CASV = CADV & 45°C X VCF @ 45°G
	30 30 308743-383 = CTOVO 45°0 X 0.9745 1001
	OFF-1000 @ 145°c = 8972.173 m3
	(Gusc) volume = areax sounding
	8972.173 = (30×18) x sounding
	sounding = 16.615 m Ullage = 20-16.615 = [3.385 m]



Sep 21 (4)	Volume of the barge: 23×19·6×14·6 = 6581·68	
140	volume of oil loaded =: 6581.68 x 84	
	$= 5528.611 \text{m}^3$	
	Cnov @ 19°C = 5528.611 m3	
transfer to the second	(0.8657) VCF @ 19°C = 0.9969	
	GSV = GOV @ 19°C X VCF @ 19°C	
	= 5528.611 × 0.9969	
	= 5511.472 m ³	
	Quartity of oil loaded = asv x density of oil at 15°c in air	
	Density in air - Density in raccum - 0.0011	
	= 0.8657 - 0.0011	***************************************
	= 8.8646	
	Quartity of oil loaded = 4765.219 t	_Junez
	Quartity of oil deliverd = 1876.450 t	
	Quartity of DIL ROB = 2888.769 t	
	Now find asv at ROB,	
	Quantity of oil = asv x density in air	
	2888.769 = CISV X 0.8646	
	CLSN = 3341.162 m3	
	@ viloge at goch is a sound to the same	
	Crsv = crov@ 9°c x vcF@ 9°c (0.8657)	
	3341.162 = aov @ 9°c x 1.0046	
	crov @ 9°c = 3325.863 m3	
	(600) volume = areax sounding	
	3325.863 = (23×19.6) x sounding	
	Sounding = 7-378m	
	Ullage = 14.6-7.378 = 7.222m	_
	Final ullage if ullage port is 1.27 m above the tark	
	= 7.222 +1.270	
	pubonas x (51×12)	
	and all a probability	
	[weeks] 50.91 - 06 - 360.11)	



	D wlage at 47°c						
	asv = aov @ 47°c x vcf @ 47°c						
	3341.162 = GOV @ 47°C X 0.9753						
	GOV @ 47°C = 3425.779 m3						
	(GIDV (GYT'C) VOLUME = areax sounding						
	3425.779 = (23×19.6) × sounding						
	sounding = 7.599m						
	Ullage = 14.6 - 7.599 = 7.000m						
	Final ullage if ullage port is 1.27 m above tank						
	= 7.000 + 1.27						
	78.0 - 100 12 110 71 12 (8.270m)						
June22	Reply conference forth a property						
7pr 21,5	Quantity of oil loaded = asv x density of oil at 15°c in air						
EP 17,	Density in air = Density in raccum - 0-0011						
	= 0.900-0.0011						
	= 0.8989						
*	400 = 1 asv x 0.8989 10 10 similar						
	GSV = 444.988 m ³						
	@ Ullage at load port =?						
	asus adov @ 28°0 x vor @ 28°0 (0.900)						
	444.988 = aov. @ 28°c x 0.9905						
	CLOV @ 28°0 = 449 256 m3						
	(Gov e) volume = area x sounding						
	449.256 = (3.1416x 4x4) x sounding						
	500 500nding =0.00 449.256 000 00 000 000 000						
	281 3 37 x 3-1416 x 4× 4× 400 123						
	Sounding = 8.938m						
	Ullage = 10-8.938 = 1.062m						
	D unage if temp user at 38°c =?						
	asv = aov@ 38°0 x vcf@ 38°0						
	444.988 = COV @ 38°C × 019832						
	GDV @ 38°C = 452.592 m3						



	/ (aOV)	
-	(238°c) volume = areax sounding	
	452-592 = (3:1416x4x4) x sounding	
- t	sounding = 452.592	
	3.1416 X4X4	
	sounding = 9.004	
	Ullage = 10-9.004 = 0.996m)	
Nav. na . O		Mar 20
NOV 20 6	of today solution	
	Height of took = 10 m Area of took: $\frac{9000}{10} = 900 \text{ m}^2$	
	Area of tank: $\frac{9000}{10} = 900 \text{ m}^2$	
	· Density of oil at 20°c = 0.87	
	density correction factor = 0.0006 per°c	
	Density of oil at 15°C = ? (temp +, then vol. + & density 1)	
	= 0.87+(0.0006x5)	
	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
þ	(240)	
	volume of oil we can load = 900x(10-0.22)	
	\$ 8802 m ³	
	crov@ 42°c = 8802 m3 doubtful	
	(0.873) VCF, @ 42°C = 0.97938 on 0.9794	
	asv = aov@ 42°C x vcf@ 42°C	
	asv = 8802 × 0.97938 0 van	-
	45V = 8620.503 m3	
	60000005 X (ANG X 200 5) . 955 666	
	@ Ullage on completion of loading at load port	
	asv = cov@ 18°c x vcf@18°c	Jan 21
	8620.503 = COV@ 18°C X O.9977	
	610V @18°C = 8640-376 m3	
	(Grov) volume = area x sounding	
	8640.376 = 900 x sounding	
	sounding = 9.6 m 1 2 min	-
	Ullage = 10-916 = [0.4 m]	
11		



-		(B) while loading volume left = 9000 - 8620.503
The state of the s	-	= 379.497
Marine and American	The state of the s	percentage volume left for expansion =
THE PERSON NAMED IN COLUMN NAM		379.497 9000
and the last of th		9000
		= 421./.
	Mar 20 (3)	volume of tank: 25×20×18 = 9000 m3
The same of the sa		Value of carea (noded: 25x20x(18-085) Ulage = 1.85
		= 25 x 20 x 17.15 vilage = 0.85
-		wine 102 x (UXZ) = 8575 m3
\dashv		C10V@ 358= 8575 m3
T		(0.7850) VCF @ 35°C = 0.9809
=		asv = apv @ 35°c x vcf @ 35°c
+		GSV = 8575 X 0.9809
\dashv		GSV = 8411.218 m3
\dashv		
-[-	Quantity of oil Goaded in tank = ?
$-\Gamma$		i.e. asvx density of oil at 15°c in air
1		Density in air Density in vacuum 0.0011
1		10.7850 - 0.9011.
1		0 5 1 = 00×7839 t/m3
1		Quartity of oil 10aded= 18411.218 X 0.7839
		= 6593.554 t
		ELECTION OF THE PROPERTY OF THE STANDING OF THE PROPERTY OF TH
Ja	1208	Ullage found after wading = 2.2m
	The second secon	ullage port extending above deck = 1.0 m
harran		Actual ullage = 1.2 m
The second second		vol. of FO wooded = 15×10×(19-12)
garine state of the		= 15 × 10 × 8 8
		$= 1320 \text{m}^3$



	60 v @ 40°C = 1320 m ³	
	(0.3650) VCF @ 40°C = 0.9806	march (
	asv = aov@ to°c x vcf@ to°c	Sep19, July
-	GSV = 1320 X 0.9806	
	$GSV = 1294.392 \text{m}^3$	sep18 (1
	@ ullage when cooled down to 30°c	
	CISV = CLOV @ 30°C X VCF @ 30°C	
	1294.392 = aov@30°c x 0.9883	
	aov @ 30°c = 1309.716 m³	
	(Gov c) volume = areax sounding	
	1309.716 = (15×10) × sounding	
	Sounding = 1309.716 0000	
	15 x 10 28 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	
	278 3 70V = 8731m	
	Ullage = 10-8.731, = 1.269 m	
	Final mage when Emage port is Im above deck	
	= 1+1.269	
	=2.269 m	
	Figure 19 to his per sure out, 1 4 5 3 egic	
	10 mage when cooled down to soc	
	USV = GOV @ 50°C X VCF@ 50°C	
	1294.392 = GOV @ 50°C X 0.9729	
	COV @ 50°C = 13300447 m3	
	(cove) volume = area x sounding	
	1330 .447 = (15×10) X sounding	
	(Sounding = 1330:447 (3) 300(11)	Ou .
	1 and 1 Mission	
	10 1 300 F 8.870m	
	UII age = 10-8.870 = 1.130m	
	Final ullage when ullage post is In above deck	-
Committee of the Commit	1 3081	
-	= 1 + 1.130 $= [2.130 m]$	
	=12.73079	



March 9	see solution at page 54,55
cimiliar:- sep19, July18	
34.3/00	VOI. of tank = 20x15x10.6 = 3180 m3
sep18 (10)	vilage after wading = 3.20m
	Ullage pipe extended above = 0.91 m
	Actual ullage = 2.29m
(4)	THE STATE OF THE S
	volune of oil waded = 20×15×(10.6-2.29)
	= 20 × 15 × 8·31
	1998 8188 7 78 Pt = 2493 m3
	34°CM 2493 01
	Density @ 30°04°= 0.8502
	density correction factor = 0.0009/°c temp. 1, denity 1
	Density @ 15°c = 0.8502+ (0.0000x 19)
	= 0.8673 t/m3
	oil incuferred at 20°C = 108 at 3
	C704 @ 34°C = 2493 m3
	(0.8673) VCF @ 34°C = 0.9853
	Casve Gov @ 34°C x VCF@ 34°C
2	= 2493 x 0.9853
	= 2456.353 m ³
	(a) If temp changes to 20°C 1000 0 120 1010
	asv = aov @ 20°C x vcF@ 20°C
1997	2456.353 = Cov @ 20°C x 0.9961
	ciov @ 20°C = 2465.97 m3
	percentage of filling = 2465.97 x100 = 77.546.1.
	1100 0 - 8188 03180
	(b) If temp. changes 40 64°C
	6,400th 10 of on 1, tour 2368 516 X C- 8303
	1 h68-9961
	KOB : 108 800 t
	fuer consumed 1888 334 t



40xch 18,(1) volume of tank: 26.4×11.47×9.13= 2764.637 m3 nay 22 Ullage on departure @44.3°c = 2.544m Ullage pipe extended = 1.070 m Actual whoge = 1.474m vol. of oil in tank at departure = 26.4×11.47 × (9.13-1.474) = 26.4×11.47×7.656 = 2318.298 m3 COV @ 44.3°C = 2318.298 m3 (0.8313) VCF @ 44.3°C = 0.9755 USV = CLOV@ 44.3°C X VCF@44.3°C GSV = 2318. 298 x 0.9755 95V = 2261.5 m2 + + 1 oil transferred at 26°c = 108 m3 ie. cov @ 26°C = 108 m3 (0.8313) VCF @ 26°C = 0.9908 asv = 600 @ 26°C X VCF@ 26°C = 108 x 0.9908 = 107.006 m3 Total asv = 2261-5+107.006 = 2368.506 m3 Total vol. of oil in tank Quantity of oil in tank =? asy x aeruity of oil at 15°C in air Density in all = Density in vaccum - D.DOII
@ 15°C = 015°C - D.DOII = 0.8313 - 0.0011 = 0.8302 t/m3 Quartity of oil in tank = 2368.506 × 0.8302 = 1966.334 t ROB = 108.000 t Fuel consumed = 1858.334 t



1	
	in 949 hours, 1858.234 + of fuel consumed
	" 1 " , 1858·334 t " " " "
	949
	In 24 hours, $1858.334_{\times 24} = 46.997t$ of fuel consumed 949
-	
	Hence, doily consumption is (46.997 to
•	





Max" quantity of cargo which can be waded = Area of tonk topy wad density CAPT J.S. UPPAL 29-12-204 O A tween deck is 18m x 15m x 4m and has a permissible wad density of 5t/m2. Steel billets OF SF 0.35 m3/t and general cargo of SF 4.0 m3/t are to be loaded therein to fill all the available spaces. Find the maximum quantity of steel billets that can be loaded and the quantity of over stowed general cargo so that the load density is not exceeded. volume of compartment = 18x15x4 = 1080m3 deck = 18×15 = 270 m2 permissible weight = areax density (see formula on top of the 270×5 = 1350 tonnes n tons of stell billets we load & Lets y tons of general cargo we load SO, x+y=1350 - 0 weight = volume/SF Space occupied by steel billets: weight X SF so, volume occupied = = 2X0.35 weigh XSF 0.35x m3 weight XSF occupied by gen cargo = 4-4 m3 2 0.35x + 4y = 1080Solving equation 0 40 $\chi + y = 1350$ y = 1350-x 0.35x + 4y = 10800.35x + 4(1350-x) = 1080 0.35x + 5400 - 4x = 10805400-3.65x = 1080 5400-1080 = 3.65× 4320 = 3.65x



x = 4320 3.65

x = 1183.562 tonnes

Since y = 1350 - x= 1350 - 1183 · 562

= 166.438 tonnes

Hence, ship can wood 1183.562 tonner of steel billets & 166.438 tonner of general cargo to fill up the tween deck complety and not exceeding the wood density.

* Preight based on stowage factor

- · Cargoes of stowage factor 1.2 m3/t or more are treated as measured cargoes. In this case, frieght is charged on the volume occupied the cargo.
- · cargoes of stowage factor less than 1.2 m3/t are treated as deadweight cargoes and frieight is charged on their weight
- · Cargoes having stowage factor 0.56 m³/t or cesser are termed as high density cargoes. When such cargoes are coaded in buck, there is special requirement.

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Walter Committee

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Section 1



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aues 0:-
A assignment of marbles in boxes having stowage factor 1.05 m3/ton to be
loaded in cargo space having bale capacity equal to 1750 m3
- calculate the total amount of weight that can be loaded
        cargo hold space = 1750 m3
         SF of cargo = 1.05 \, m^3/ton
         Cargo we can load = volume = 1750 = 1666.667t
 calculate the total amount of cargo to be loaded if 6% broken stowage is
  allowed
  Broken stowage is the space b/w cargo which remain unfilled
  Hence, we require new SF
     Required SF= SF+ (SFX BS)
                       = 1.113 \text{ m}^3/\text{t}
         Cargo we can toad @ SF 1.113 m3/t = 1750 = 1572 327 t
                                            1.113
DA hold of 8m x 6m x 4m is to be filled with steel pipes (SF 1.06 m3/t) &
paint drums (SF 1.85 m3/t). If the load density of the tank top is 3.24/m2,
upto what height should the steel be loaded so that the hold is filled
without exceeding the look density? How many tonnes of steel pipes and paint
drums can be waded?
            VOI. of Hold = 8x6x4 = 192 m3
          Area of Holde = 8x64= 148 m2 & m 11300 1 3000
            Load density = 3.2 t/m2
                                           Max of volume of pipe that we conload
         cargo can load = area x density
                                                   = weight XSF
                                                   = 153.6×1.06 = 162.816 m3
                       = 48×3.2
                                           Maxm height = maxm volume = 162-816 = 3.392
                     = 153.6 t
             assume, it tonnes of steel pipes we can load
       lets
                  & y tonnes of point drums we can load
                     x+y= 153.6 - 0
```

Const + x=153.6+4 + 1. 1 - 1 down by many 107



	Space occupied ? By steel pipes	By paint drums
	= weight XSF	= weight x SF
	= 2 × 1.06	= y x 1.85
	= 1.06 x m3	= 1.85y m3
	1.06x+1.85y =	192 m³ — 0
	By solving equation 1 20,	
	1.06/1621 11) . 1 6611 - 100	1 y = 36.942 t
		53.6-8
		6.658 t
	So, we can load	116.658t of steel pipes &
Jps 3	A hold of general cargo ship measur	36.942t of point drums
21		761000
	layer 5cm high and side batters ex-	
	cargo of 50 machinery cases of 1.5	
	Bis. 121/ and situated	
C-10 ·	B.S. 10:1. and S.F 1.6m/t	
Soln:-	Side batters - 0.2m from ship side	i.e. both P&S = 0.2+0.2=0.4
	dunnage height - 5 cm = 0.05 m	(
	volume of hold > 20x (15-0.4) x((9.05-0.05)
	$=20\times14.6\times9$	
	= 2628 m ³	
	1 New S. F. of cotton bases = SF	= + (SFX BS 100)
	= 2.5	5+(2.5×\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
	7/18 (P) = 9	275 m3/t
	Space occupied by cotton be	ales = 200×2.75
	70.14	$= 550 \text{m}^3$
10.360	@ New s.f of jute bales = 1.67	-(1.6 × 10)
	= 1.9	$6 m^3/t$
	space occupied by jute bales	
	Be a second of the poly of	$=1.76 \text{m}^3$
	3 vol. occupied by 1 macrinery can	se = 15x1.3x2
		$= 3.9m^3$
The second second second second second	vol. occupied with Bs = 3.9+ (3.	9 × 20 \ - 4 10 m3



Vol. occupied by so cases = weight xsf = 50 x f 68 = 23 + m ³ 23 + + 550 + 1.76 x = 2628 1.76 x = 18 + t x = 10 + 7.72 A ship hold has a base capacity of 680 m ³ and a gran capacity of 785 m ³ and is filled with a maize stowing at 1.27 m ³ /6 H is now intended to discharge 175 tons of maize and wad bagged mai intended to discharge 175 tons of maize and weight 50 kg in the same hold. The bags are 0.5 x0.4 x0.3 and weight 50 kg in the space lost beetween the bag is 12·1, how many from of bagged maire can be wooded 3.5 of 20·1 Alu. Step0. Vol ^m occupied by 1 bag = 0.5 x0.4 x0.3 =0.06 SF of a bagged maize = vol. = 0.86 / 50 xg = 50/ = 0.06 weight 0.05 / 1000 = 1.2 m ³ /t New S.F = 1.2 + (1.2 x12) = 1.2 + 0.14 + = 1.34 + m ³ Step 8: vol ^m of moire discharge = weight x.SF = 205.619 m ³ Step 8: Total tons of bagged maize which we can load is volume = weight x.SF 205.619 = \omega x 1.34 + weight = 153 t		
23++550+176x = 2628 176x = 18++ x = 10+7.72 A ship hold has a base capacity of 680 m³ and a grain capacity of 735 m³ and is filled with a maire stowing at 1.27 m³/6 H is now intended to discharge 175 tons of maire and took bagged maire in the same hold. The bags are 0.5 x 0.4 x 0.3 and weight 50 kg of a The space lost beetween the bag is 12.1, how many form of bagged maire can be loaded 3s of 20.1 Aus:— Step0:— v01 ^m occupied by 1 bag = 0.5 x 0.4 x 0.3 =0.06 SF of a bagged maire = v01:= 0.06 (50 kg = 50) = 0.06 weight 0.05 =1.2 m³/t New S.F = 1.2 + (1.2 x 12) =1.2 + 0.14+ =1.34 + m³ Step @:— v01 ^m awailable for bagged maire = 680 x 222 25 m³ Step @:— v01 ^m awailable for bagged maire = 680 x 222 25 735 =205.619 m³ Step @:— Total tons of bagged maire which we can load is volume = weight x s f 205.619 = \omega x 1.34 t weight = 153 t		and accupied by 50 cases = weight XSF
23++550+176x = 2628 176x = 18+4 x = 10+7.72 A ship hold has a base capacity of 680 m³ and a gran capacity of 735 m³ and is filled with a maire stowing at 1.2 m³/6. It is now intended to discharge 175 tons of maire and wash bagged maire in the same hold. The bags are 0.5 x 0.4 x 0.3 and weight 50 kg or of a The space lost beetween the bag is 12.1, how many tons of bagged maire can be wooded 3.5 of 20.1 Ala: Step0: V01 ^m occupied by 1 bag = 0.5 x 0.4 x 0.3 =0.06 SF of a bagged maire v01: = 0.06 (50 kg = 50) = 0.0 weight 0.05 (50 kg = 50) = 0.0 1	March Comment of Control of the Cont	
234+550+176x = 2628 176x = 1844 x = 1047.72 A ship hold has a bale capacity of 680 m³ and a gran capacity of 785 m³ and is filled with a maire stowing at 1.24 m³/6! H is now intended to discharge 175 tons of maire and load bagged mair in the same hold. The bags are 0.5×0.4×0.3 and weight 50 kg to 4 a The space lost beetween the bag is 12.1, how many tons of bagged maire can be loaded 3s of 20.1 Alu: Step0: V01 m occupied by 1 bag = 0.5×0.4×0.3 =0.06 SF of a bagged maire = v01: = 0.06 (50 kg = 50) = 0.06 weight 0.05 100 =1.2 + 0.144 =1.34 + m³ Step 0: V01 m available for bagged maire = 680 × 222.25 m³ Step 0: V01 m available for bagged maire = 680 × 222.25 735 Step 0: Total tons of bagged maire which we can load is volume = weight x s f weight = 153 t weight = 153 t	b	= 23+ m
A ship hold has a bale capacity of 680 m³ and a gran capacity of 735 m³ and is filled with a maire stowing at 1.24 m³/t H is now intended to discharge 175 tons of maire and load bagged mair in the same hold. The bags are 0.5 x 0.4 x 0.3 and weight 50 kg to 4 a The space lost beetween the bag is 12 f, how many form of bagged maire can be loaded. 3.5 of 20 f. Aux. Step 0: V01 m occupied by 1 bag = 0.5 x 0.4 x 0.3 = 0.06 SF of a bagged moire = V01: = 0.06 (50 kg = 50) = 0.00 weight 0.05 1000 = 1.2 m³/t New S.F = 1.2 + (1.2 x 12) = 1.2 + 0.144 = 1.344 m³ Step 0: V01 m available for bagged maire = 680 x 292 25 735 = 205. 619 m³ Step 0: Total tons of bagged maire which we can load is volume = weightx SF weight = 153 t		x 38569 at 9
A ship hold has a base capacity of 680 m³ and a gran capacity of 785 m³ and is filled with a maize stowing at 1.27 m³/t H is now intended to discharge 175 tons of maize and toad bagged mair in the same hold. The bags are 0.5×0.4×0.3 and weight 50 kg in the space lost beetween the bag is 12.1, how many tons of bagged maire can be loaded. 3s of 20 f An: Step0: V01 ^m occupied by 1 bag = 0.5×0.4×0.3 = 0.06 SF of a bagged maire = V01 = 0.06 (50×2=50) = 0.0 weight 0.05 = 1.2 m³/t New S·F = 12 + (1.2×12) = 1.2+0.14+ = 1.34+m³ Step@: V01 ^m of maire discharge = weight x.SF = 1.2+0.14+ = 1.34+m³ Step@: V01 ^m available for bagged maire = 680 x 222.25 m³ Step@: Total tons of bagged maire which we can load is volume = weight x.SF 205.619 = w x 1.3++ weight = 153 t	•	1.74x = 1844 ANTONIA LONGONIA
A ship hold has a bale capacity of 680 m³ and a gran capacity of 735 m³ and is filled with a maire stowing at 1.27 m³/t H is now intended to discharge 175 tons of maire and load bagged mair in the same hold. The bags are 0.5×0.4×0.3 and weight 50 kg of a The space lost beetween the bag is 121, how many tons of bagged maire can be loaded 3s of 20.1 Au: Step0: V01 ^m occupied by 1 bag = 0.5×0.4×0.3 = 0.06 SF of a bagged maire = v01 = 0.06 (50kg = 50/2006) SF of a bagged maire = v01 = 0.06 (50kg = 50/2006) = 1.2 + 0.144 = 1.344 m³ Step@: v01 ^m of maire discharge = weight xsf = 175 x1.27 = 1222.25 m³ Step@: v01 ^m awailable for bagged maire = 680 x 222.25 = 205.619 m³ Step@: Total tons of bagged maire which we can load is volume = weight x sf 205.619 = w x 1.344 weight = 153.4		
intended to discharge 175 tons of maire and tood bagged maire and tood bagged maire in the same hold. The bags are 0.5×0.4×0.3 and weight 50 kg. The space lost beetween the bag is 12.1, how many for of bagged maire can be tooded. 3.5 of 20.1 Au.: Step0: V01 ^m occupied by 1 bag = 0.5×0.4×0.3 =0.06 SF of a bagged maire = V01 = 0.06 (50kg=50) = 0.0 weight 0.05 (50kg=50) = 0.0 = 1.2 m ³ /t New S·F = 1.2 + (1.2×12) = 1.2 + 0.14+ = 1.344 m ³ Step @: V01 ^m awailable for bagged maire = 680 × 222.25 m ³ Step @: V01 ^m awailable for bagged maire = 680 × 222.25 735 Step @: Total tons of bagged maire which we can load is volume = weight × SF weight = 153t weight = 153t	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	a half capacity of and a gran capacity of
intended to discharge 175 tons of maire and load bagged mair in the same hold. The bags are 0.5 x 0.4 x 0.3 and weight 50 kg to f a The space lost beetween the bag is 12.1, how many tons of bagged maire can be loaded. 3s of 20.1 Au:- Step0:- v01 ^m occupied by 1 bag = 0.5 x 0.4 x 0.3 = 0.06 bales SF of a bagged maire = v01:= 0.06 (50 kg = 50) = 0.0 weight 0.05 1000 = 1.2 m ³ /t New S.F = 1.2 + (1.2 x 12) = 1.2 + 0.14 + = 1.34 + m ³ Step @:- v01 ^m of maire discharge = weight x s F = 205.619 m ³ Step @:- Total tons of bagged maire = 680 x 222.25 735 **Step @:- Total tons of bagged maire which we can load is volume = weight x s F 205.619 = w x 1.3 + + weight = 153 t	(4)	A ship hold has a battle capturing of 680 th 1.27 m3/f. H is now
In the same hold. The bags are 0.5×0.4×0.3 and weight 30 kg of a The space lost beetween the bag is 12.1, how many tone of bagged maire can be loaded 3s of 20.1 Ans: Step 0: VOIM OCCUPIED by 1 bag = 0.5×0.4×0.3 =0.06 SF of a bagged maire = VOI = 0.06 (50 kg = 50) = 0.0 weight 0.05 1000 =1.2 to 1.44 =1.34+m³ Step 0: VOIM of maire discharge = weight xsf 175×1.2+ =122.25 x³ Step 0: Voim available for bagged maire = 680 x 222.25 735 Step 0: Total tone of bagged maire which we can load is volume = weight x sf 205.619 = w x 1.3+4 weight = 153t		735 m3 and is filled with a matte showing the 12 miles
In the same hold. The bags are 0.5×0.4×0.3 and weight 30 kg of a The space lost beetween the bag is 12.1, how many tone of bagged maire can be loaded 3s of 20.1 Ans: Step 0: VOIM OCCUPIED by 1 bag = 0.5×0.4×0.3 =0.06 SF of a bagged maire = VOI = 0.06 (50 kg = 50) = 0.0 weight 0.05 1000 =1.2 to 1.44 =1.34+m³ Step 0: VOIM of maire discharge = weight xsf 175×1.2+ =122.25 x³ Step 0: Voim available for bagged maire = 680 x 222.25 735 Step 0: Total tone of bagged maire which we can load is volume = weight x sf 205.619 = w x 1.3+4 weight = 153t	in	intended to discharge 175 tons of maire and was vigged mure
The space lost beetween the bag is 12 f, how many ton of bagged maire can be loaded onsist of bagged maire can be loaded 3.5 of 20.1 Ans: Step0: VOIM Occupied by 1 bag = 0.5x0.4x0.3 =0.06 SF of a bagged maire = VOI = 0.06 (50Kg = 50) = 0.0 weight 0.05 (1000) = 1.2 m ³ /t New S.F = 1.2 + (1.2 x 1.2) = 1.2 + 0.144 = 1.344 m ³ Step @: Voim available for bagged maire = 680 x 222.25 m ³ Step @: Total tons of bagged maire which we can load is volume = weight x SF 205.619 = \omega x 1.344. weight = 153 t		in the same hold. The bags are 0.5 x 0.4 x 0.3 and weight 50 kgs.
bagged maire can be loaded 3's of 20.1 Ans: Step0: VOIM occupied by 1 bag = 0.5×0.4×0.3 =0.06 SF of a bagged maire = VOI = 0.06 (50 kg = 50) = 0.00 weight 0.05 1000 = 1.2 m³/t New S.F = 1.2 + (1.2×1.2) = 1.2 + 0.14+4 = 1.34+m³ Step@: Voim of maire discrarge = weight XSF = 175 X 1.2 + 212 22.25 m³ Step@: Voim available for bagged maire = 680 = 205. 619 m³ Step@: Total tons of bagged maire which we can load is volume = weight XSF 205. 619 = w x 1.3++ weight = 153 t	of a	The space lost beetween the bog is 12.1, how many tons of
3s of 20-1 Au: - Step0: - V01 ^m occupied by 1 bag = 0.5x0.4x0.3 =0.06 SF of a bagged maire = V01: = 0.06 (50kg = 50) = 0.00 weight 0.05 1000 = 1.2 m ³ /t New S.F = 1.2 + (1.2x12) = 1.2 + 0.144 = 1.344 m ³ Step @: - V01 ^m of moire discharge = weight xSF = 175 x 1.27 = 1222.25 m ³ Step @: - V01 ^m awailable for bagged maire = 680 x 222.25 735 = 205.619 m ³ Step @: - Total tons of bagged maire which we can load is volume = weight x SF 205.619 = w x 1.344.		bagged maire can be wooded
SF of a bagged maire = $v0!$ = 0.06 $(50 \text{ kg} = 50) = 0.00$ weight 0.05 1000 = $1.2 \text{ m}^3/t$ New S·F = $1.2 + (1.2 \times 12)$ = $1.2 + 0.14 + 0.05$ Step @:- $v0!^m$ of maire discharge = weight xsF 175 x 1.27 = $1.222.25$ m ³ Step @:- $v0!^m$ awailable for bagged maire = 680 x 292.25 135 = 205.619 m^3 Step @:- Total tons of bagged maire which we can load is volume = weight x s f 205.619 = ω x 1.34 + ω weight = 153 t	016/21 07	mi - Ctenti - vola occupied by 1 bag = 0.5x0.4x0.3
SF of a bagged maire = $v01$ = 0.06 ($50 \text{ kg} = 50 \text{ j} = 0.00$) weight 0.05 (1000) = $1.2 \text{ m}^3/t$ New S·F = $1.2 + (1.2 \times 12)$ = $1.2 + 0.144$ = 1.344 m^3 Step @:- $v01^m$ of maire discharge = weight xsF = $175 \times 1.27 = 122.25 \text{ m}^3$ Step @:- $v01^m$ available for bagged maire = $680 \times 222.25 \times 735$ = 205.619 m^3 Step @:- Total tons of bagged maire which we can load is volume = weight x sF 205.619 = $\omega \times 1.344$.		=0.06
New S.F = $1.2 + (1.2 \times 12)$ $= 1.2 + 0.144$ $= 1.344 m^{3}$ Step @: voi^{m} of moire discharge = weight xsF $= 175 \times 1.27 \times 121 \times 122 \times 25 m^{3}$ Step @: voi^{m} awailable for bagged maire = 680 $= 205 \cdot 619 m^{3}$ Step @: $Total$ tons of bagged maire which we can load is $voiume = weight \times SF$ $= 205 \cdot 619 = w \times 1.344$ $weight = 153 t$	bales	SF of a social maire = VOI = 0.06 /-0.00 = 50/ = 0.05+
New S·F = $1.2 + (1.2 \times 12)$ = $1.2 + 0.144$ = $1.344 m^3$ Step @: voi^m of moire discravge = weight xsF = $175 \times 1.27 = 1.22 \cdot 25 m^3$ Step @: voi^m awailable for bagged maire = $680 \times 222 \cdot 25 m^3$ = $205 \cdot 619 m^3$ Step @: Total tons of bagged maire which we can load is $voiume = weight \times SF$ $205 \cdot 619 = w \times 1.344$ $weight = 153 t$		weight 0.05 1000
New S.F = $1.2 + (1.2 \times 12)$ $= 1.2 + 0.144$ $= 1.344 m^{3}$ Step @:- voi^{m} of maire discharge = weight x.S.F. $= 175 \times 1.27 = 1222.25 m^{3}$ Step @:- voi^{m} awailable for bagged maire = 680×222.25 $= 205.619 m^{3}$ Step @:- Total tons of bagged maire which we can load is volume = weight x.S.F. $= 205.619 = \omega \times 1.347.$ $= 205.619 = 153 t$ $= 153 t$	1 -	
= 1.2+0.144 = 1.34+m³ Step@:- vol ^m of maire discharge = weight xsf = 175 x1.27 = 1222.25 m³ Step@:- vol ^m available for bagged maire = 680 x 222.25 = 205.619 m³ Step@:- Total tons of bagged maire which we can load is volume = weight x sf 205.619 = w x 1.344.		
Step @: voi ^m of maire discharge = weight xsf = 175 x 1.27 = 1222.25 m ³ Step @: voi ^m available for bagged maire = 680 x 222.25 = 205.619 m ³ Step @: Total tons of bagged maire which we can load is volume = weight x sf 205.619 = \omega x 1.34+ weight = 153 t		
Step @:- voi ^m of maire discharge = weight xsf = 175 x 1.27 = 222 25 m ³ Step @:- voi ^m available for bagged maire = 680 = 205 619 m ³ Step @:- Total tons of bagged maire which we can load is volume = weight x sf weight = 153 t weight = 153 t		= 1,510,144
Step 9: Volm available for bagged maire = 680 \times 222.25 \times 235 \times 222.25 \times 235 \times 235 \times 236 \times 237 \times 237 \times 238 \times 239		
Step 3:- Volm avoilable for bagged maire = 680 = 205.619 m³ Step 3:- Total tons of bagged maire which we can load is volume = weight x s f 205.619 = w x 1.344, weight = 153 t		Step 12: Vol. of moute auscharge = weight 23
Step (9):- Total tons of bagged maire which we can wad is volume = weight x s fi 205.619 = \omega x 1.344.	b.	
Step (9):- Total tons of bagged maire which we can wad is volume = weight x s fi 205.619 = \omega x 1.344.		Step 3: Volm available for bagged mare = 680 x 222.25
Step @: Total tons of bagged maire which we can load is volume = weight x sf 205 619 = \omega x 1 344.		
volume = weight \times SF 205-619 = $\omega \times 1.344$. weight = 153 t		
volume = weight \times SF 205-619 = $\omega \times 1.344$. weight = 153 t		Step @: Total tons of bagged maize which we can wand is
$205.619 = \omega \times 1.344$ weight = 153t		volume = weight X SF
weight = 153t		
1 2 3 4 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5 1 5		
		3 A
		62 1 - NOT 161 - 6 × () (XE) + 31 = 100
	page 1	



CHAPTER-FOUR LIFTING GEAR

	LIFTING GEAR
*	Blocks & Purchases
	. When load moves in the same direction as the effort it is said to "advantage
	when load moves in the opposite direction to the effort it is rigged,
	is disadvantage.
	· Mechanical advantage is the ratio of load to effort
	M·A = Load
	Effort
	· relocity Ratio is the ratio of velocity of effort to velocity of war.
	V.R is also equal to n+1 (when purchase is used to advantage)
	(when purchase is used to disadvantage)
1.2	• Efficiency of a system = MA × 100%
	Outlies was a change pulling aboutward
Ques O:-	A gun tackie used to advantage & luff tackie used to disadvantage are
	used in combination to lift a wood of 4 tons. The load is supported
	from gun tackle calculate
	@ The effort required to lift the wad
	6) The efficiency of the system
	10 The minimum size of nylon rope to be used in each tackie
S01":-	O GUN TACKLE
	$10 \text{ ady } \omega = 4t$ no. of sheeve, $n=2$
	Loady $\omega = 4t$ no. of Sheeve, $\eta = 2$ velocity ratio, $V \cdot R = 2 + 0 = 3$
	Friction) Note: - Take friction 10.1-, if not
	ord some V-Record of some of specified in question
	$\frac{10}{100} = \frac{(4+(2\times4)\times\frac{10}{100})}{2} = \frac{4+0.8}{2} = 1.6t$
	ंगरिके तक = 3 3
	LUFF TACKLE
	LOady w= 1.6t (box weight coming on luft tacket is 1.6t, rest weight is taken by gun
	no. of sheeve, n=3 velocity ratio, v.R = 3 (disadvantage)
	Effort = (w+nw x friction)
	V.R
	$= 1.6 + (3 \times 1.6) \times \frac{10}{100} = 1.6 + 0.48 = 0.693 t$
	3 3



```
So, Final effort required to lift the load is 0.693t
 (b) Efficiency of system
                       M.A X 100%.
        M.A = Wad/effort
             = 4/0.693
             = 5.772
     Total v. R = v. R of gun tackle x v. R of luff tackle
               = 3×3
                 = 64.13%
                stress = S.W.L X f.S
  (C) Breaking
                                    > Factory of safety
                                     (& if it is not mentioned in questhen take it 6)
                       = 0.693 \times 6
                 B.S
                   B.S = 4.158
      Since, we know B.s of nylon rope = 502
                                              300
                          4.158 = 5D^2
                                             300 HS 31 10 - 100
                                     D2 = 249.48
                 350001 (30) 10 40 1 3 Dos 15.79 or 16mm
2A simple desnick is fitted with a 6x24 wire rope of 28mm diameter. The chain
 register specifies a safety factor of 7. Calcute the maximum load that can be safely
                                                           lifted by this demok.
 Sol: D = 28mm
                 stren of 6x24 wire rope = 2002
                                            500
                                         = \frac{20 \times 28^2}{500} = 31.36
              B.S = SWLKFS
             31.36 = SWL X7
```

(86)



4 sheave

Ques B:- A weight 12T is to be lifted by 2 fold purchase rigged to advantage The holding part of this purchase is attached to the single sheave block of a luff tackie. Find the size of gylon rope which has to be used for each purchage and the efficiency of the system (Assume VR of the system to be the product . Soil of individual VRs, friction 81 per sheave & factor of safety 6) Twofold: load, $\omega = 12t$ velocity ratio, v.R = 4+0=5 no of sheeren = 4 Effort, E = w+(nwx Friction) V.R $= 12 + (4 \times 12) \times \frac{8}{100}$ 12+3.84 = 3.168t luff tackle w = 3.168to disadvantage $V \cdot R = 3 + (0) = 3$ n= 3 E = 3.168 + (3×3.168) X 800 is final effort Efficiency of the system = M.A x100%. 0 loady = 12/1.309 = 9.167 Final V-R = V-R of two fold purchage x V-R of luff tackle = 5×8 = 15 Efficiency = $\frac{9.167 \times 100}{15}$ For two B.S = Effortx & S S.W.LXf.S **For luff** Breaking fold purchage, OT Effort = 3:168 X 6 = 7.854 = 1.309 x 6 = 19.008 stren of a nylon rope = nylon rope = B.S of 7.854 = 57 522= 5702.4 522 2356.2 D2= 11+0.48 D2 = 471.24 D = 33.8 = 34 D= 21.71 = 22 mm



5 sheevel A simple derrick is used to lift a load of 8 tons of gyn tackle ngged to advantage Rues 19: sheave block of a used to disadvantage if the wire is 6x24. What should be the used for each purpoye $V \cdot R = 5 + 0 = 5$ diameter of wire . FS = 6. to be the product . Soin :no. of sheeve = 5 W= 8t fety 6) Effort, E = W+ nwxfil. V.R -advantage $= 8 + (5 \times 8) \times \frac{10}{100} = 2.4 t$)=5 V- K = 4.40 Breaking stress = Effort X F.S = 2.4x6 = 14.4 2002 Breaking stress of 6x 24 wire rope = $14.4 = \frac{20D^2}{500}$ D = 18.97 = 19 MM 11 300, 00 2011 115 of sheere, =11=2 A steel girder weighing It is to be lifted by a single demick Ques 3:using a gun tackle in advantage. A block at the dernick head leads the wire down to the winch find the minimum size of 6x37 wire to be used as the runner wire. Chun TACKLE: - wady w = 7t + n=2 v.R = 2+0=3 Effort, E = W+nwxF1 = 7+(7×2) × 10 = 2.8t= 59 527 p Rest wood is support by derrick head block V-R = 1+0=1 disadvantage but tood moves in the apposite w= 2.8t n= 1 Effort, E= W+nWXF1 ge, B.S = Effort XFS V.R = 3.168 X6 = 2-8+ (1.X2-8) X 10 3.08 t = 19.008 7 final effort of nylon rope = $\frac{53}{300}$ Breaking stress = Effort X FS 19.008= 502= 5702.4 = 3.08×6 = 18.48 Breaking stress of 6x37 wire rope = 2122 D2= 1140.48 18.48 = 2102 D = 33.8 = 34mm

500

D = 21 mm



Ques 6:	A weight of 10t is to be lifted with two fold purchase rigged	Ques (
page - not not trade at seaso, or grants	to disadvantage The howling post of this purchase is secured to the	
	moving block of a gun tackle nigged to advantage calculate the	
	@ Effort required to lift the boad.	
and the second s	6 Efficiency of the system	Sol
	@ Size of nylon rope required for the two fold purchase.	
Sorn:	Two fold purchase:	
	$LOODY \omega = 10t$ $no. of sheeve, n = 4$ $V \cdot R = 4 + 0 = 4$	
	Effort & E = w+nwxf./	
	ViR	
	$= 10 + (4 \times 10) \times \frac{10}{100} = 10 + 4 = 3.5 t$	
	+ 4	
	Coun tackle advantage	
	$load_1 w = 3.5t$ no. of sheeve, $en = 2$ $v \cdot R = 2 + 0 = 3$	
	Effort, $E = \omega + n\omega \times F \cdot l$	
	v·R	
	$= 3.5 + (2 \times 3.5) \times \frac{10}{100} = 1.4 t$	
	3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	B M.A = wady = 10/1.4 = 7.143	
	Efficiency of the system = M.A. X100.1.	
	V.R	
	×100 = 59.524 ./.	
	4×3	
	@ Breaking stren = Effort x F.S	
	$=1.4\times6=8.4$	
	Breaking stress of nylon rope = 502	
	300	
	$8.4 = 59^2$	
	300	
	50° = 2520	
	D = 22.45 = 23 mm	



of the armage from
The having post of gyn tackle is attached to a moving block of
a luff tackle calculate the percentage of efficiency of the system
when a 24t weight is being lifted. Both tackles are nigged to
advantage and friction per sheave is estimated as 5.1. of the word Chyn tackle 1200 \times 1000
City tackle the sale to the sale advantage
$loady w = 24t$ no. of sheeve, $n = 5$ $v \cdot R = 5 + (1) = 6$
Effort, E= W+nWXF-1.
Commission and another than the second to
$= 24 + (24 \times 5) \times \frac{5}{100} = 5 t$
July 60, 50, 400 60 60 60 100 100 100 100 100 100 100
Luff tackie:- Advantage
Luff tackie:- wady $w = 5t$ no of sheeve, $n = 3$ $v \cdot R = 3 + 0 = 4$
35 X EELLONT ENGINEET NON X E. V. 35 X TAKING SUMMO
of this is in Amorio V-R
$= 5 + (3 \times 5) \times \frac{5}{100} = 1.438 \pm 20$
4
M. A = wady Effort to 100 shall be send a
= 24/1-438 = 16.696
Total V.R = V.R of gyntackie x V.R of luft tackie
= 6×4 = 24 () (8)
Efficiency of the system is 16.696 x 10
24 XII
Dien half of high bill = 69.565%
the continue are modern of early continued.
· Height = Volume
and the second s
15 x mbiom shows south
CO-C × C FO · is i.
Control Cario
12) Erd Man of
111
Exercise to the following to



Previous year paper solution

inad	density, s	C ple
- WILL	00000	CCC

	Load density, SF etc
NOV AU	volume of hold = 10 x 10 x 9 = 900 m3
Jan Jane	Area of hold = 10×10 = 100 m²
	Load density of tank top = 4.5t/m2
Similiar:-	
Month sep	Max" cargo we can load = area x density
oct 21	= 100 × 4.5
	= 450 tones = 5
aj	How many tonner of each cargo can be loaded?
	Lets assume, it tomes of steel plates we can wad
	250450-x t of steel coils we can load
	steel plates steel coils
The state of the s	Volume = weight x SF
A control of the cont	volume = xx2.05 Volume = (450-x) x1.86
The state of the s	$= 2.05 \text{ mm}^3 = \frac{1}{2} \times (2 \times 6) + 6 = 837 - 1.86 \times 6$
The state of the s	
77 - 18-40	volume of hold = vol. of steel plates + vol. of steel coils
	900 = 2.052 + 837 - 1.86x
man-hyperge	900-837=2.05x-1.86x
to the second	63 = D.19 N = + X3 = -
- The state of the	331. 579 t i.e. steel plates
	vc .
	450-x=118.421th, i.e. steel coils.
Ы	Calculate the height of each cargo.
The state of the s	· Height = volume
The contract of the contract o	area
	where volume = weigh xsf
	= 331.579x2.05
	$= 679.737 \text{m}^3$
	SO, height = 679.737
	- [6.797m] i.e. of steel plates
A designation of the state of t	1.e. of steel plates



Control of the Contro		
	· volume = 118.42	1×1.86
	= 220.	263 m³
1 1 . 5	Height = 220.	263 209 HOU
	100	
	= 2.2	1.03 m i.e. of steel cals.
	Committee (Beef mess	The Company of a State of
July 21	2 volume of hold:	= 18×14×6 = 1512 m3
-0	Area of hold=	$18 \times 14 = 252 \mathrm{m}^2$
	and Load density of	tanktop = 6t/m2
	10139 + 1/200 5 - 35	5 x 5 1 x 2 4 = 5, 60 (m) 1 1/4 \$ 527
	Maxm cargo we co	in load = areax density
	(3) X35 (25 X)	= 252 X G
	= 25+0-25	= 1512 tonnes.
	Lets assume x ton	of steel billets we can load with
	1 2 x ang le 1512-x Hons	of general cargo we can load
	= 200x2.35	Era PES:
	steel billets	General cargo
	69 = 0.5 m3/t	$SF = 3.5 \text{ m}^3/\text{t}$
	1085+188/3-8535 = 10to	m may not improves something
	Req. SF = SF+ (SFX BS)	Req. SF = SF + (SFX)
	= 005+ (05×8)	$= 3.5 + (3.5 \times \frac{10}{100})$
	= 0.5+0.04	10100 ± 3:5+035
	= 0.54 m ³ /t	40128 + 1/m 3= 3:85 m3/t
	: volume = weight XSF	(21 volume) weight x SF
	= 2 x 0.54	= (1512-x) x 3.85
	= 0.54x m3	31 (3 + 3) = 5821.2 - 3.85x
		1/2 m 1/2/
	volume of hold = vol.	of steel billets + vol, of geo, cargo
	1512 = 0.54	x + 5821.2 + 3.85 x w - 19191
The second second	1512-5821.2 =	0.54x 73.85%1 - dipious
	The state of the s	- 3 31% F FUGI = talkings
	x = 43	09.2
		01.873 i.e. steel billets.



	1512-x = 210.127+ i.e.g	eneral compo-	
Apr. 21		rom ship side i.e. both P45 = 0.2+0.2=04m	
	(decrease the breadth)	som styp state ter both t 45 = 021 0 == 0.71	
	(decreases the height)		Sep19 (
-	volume of cargo hold = 2	DX (15-D4) X (0.05-0.05)	Ser13 C
	U U	20 × 14.6 × 9, WARY	-
		01.00 m3	
	Machinery cases	cotton bales	
	vol. of 1 mach. case = 1.5×1.3×2	SF = 2.5 m3/t + BS 101.	
-	vol. occupied with $6S = 3.9 \text{m}^3$	Req. Sp = SF + (SFX BS)	-
-		$= 2.5 + \frac{(2.5 \times 10)}{100}$	
	$= 3.9 + 0.78$ $200001 \pm 14.68 \text{m}^3$	= 2·5+0·25) to
-		$= 2.75 \text{m}^3/\text{t}$	1862
-		VOI = Weight XS.F	
-	$= 234 \text{m}^3$	= 200×2·75	Tea .
-		= 1550 m ³	
-	6,100 modern	1/2037 = 19	
-	Now, volume available for jute		
	10 to	Req. SF 484-486 55	
1 1	× 2 · 7 1 · 5	1844 m ³	
1.004		+0.0+20	14/
*	Tate bales		
	SF = 1.6 m3/t + BS 10.1.	1/210 h 5 - 9 =	_
	New s.F. SF. + (SFX BS)	To X supion : Growing	
. 26.1	= 1.6 + (1.6x 100)	NS ON A COMMENT	
728	- 0.1088 = -1.6+0.16	Ju Kh5-2	
nd .	=1.76 m ² /t		
-	ogos voll, to weight XISF 53918		- 3
	1844 = weight X 1.76	+ x45 -0 = 11.11	
	weight = 1844/1.76 *1	15.0 - 1 108: (0)	
	weight = 1047.7271 t	(4.7)	
		CASE A STATE OF THE STATE OF TH	
	173) 1 (. sp. cs - 111612		



	No of jute bales = ? (if each jute	bales	weight 50	0 KG)	
	= 2095.454	Jåt-		1 ton= 100	10 KG
	= 2095	312	- 1	10479727t= 10	
	No. 10 July 1997	0 E	7,	i Şərin d	500
019 (4)	Grain capacity = 6600 m3	1021			
	Bale capacity = 6200 m3	08	((+)	Modern F	
-	@ what was the quartity of buck	grain?	- k-	Product And Fr	
	S.F = 1.8 m3/t + BS 9/	77H	1 1	La Crist	
		1039			
	= 1.8+0.162				
	= 1-962 m3/t 2 22	city)	of sound	First. ne	
	volume = weight x SF . 279 b 113	isust (in higher	3(0 + 62)	
for the	16600) = weight x1.962 3000	sus i	in, which	2 00 -	
ख्युकात्र व	weight = 6600/1.962 =				1
	= 3363-914t				
-	1 How many bags were filled up	from	above grain	n?	
	3363-914X 1000 = 33635	314 =	67278.28	bags	
	7.2% MX 5.0	= 3M	11174	, 1 8 2 , 12 1 2 1 2 1 2	
	@ How many bags are finery loads	ed to	fill up the	hold?	
	volume = weight xs.F	: 1.2			
	6200 = weight 2.1	r'			•
N'm'er	U		(12) sur:	14 . 1 . 22	y 4
	= 2952			-	
	No. of bags = 2952.381 X 10	00 = 3	2952381	5904716	2 bags
	2:21-0061 - 3700	listin	50, H	e ao	
	1008 -2		the same of the same of the same of		
Sep18(5)	NO.2 LH 7661 0641 = SHOWS	N	D.2.T.D		
	volume = 1700m300321	VO	lune = 1410	m ³	
invitiar:- 1418,700 16	area = 15×10 = 150 m2 × 1 minus =	o vusa	rea = 15x	$10 = 150 \text{m}^2$	
J	Load density = 8+/m² 12 / 000	w	ad density =	5 t/m2	
	Max cargo we can load : areax density		Concession from the second section is a second section of the section		



			and the same of th			
	cargo	S.F	Weight	vol. = weight X S.F	DISCHARGE PORT	Jan19
	ore	0.5	400	200	Hong Kong	
	Curnies	1.7	500	850	11 11	
	Rubber	2.0	100	200	u "	
			1000t	1250 m ³	Para 190 miles in inches	
	Tea chest	3.0	80	240	Singapore	
	machinery	2.0	70		because of the	
	gunnies	1.7	400	1689 11608	1	
			550t	1060 m3) + 8	The same of the sa	
				8+0162	1 =	
	First, w	e have-	to discharge	e at singapore	3	
	50, W	e keep it	on tween a	deck. 78 x topion =	volune	
	Dn.	2TD, We	ight availab	le = max "weight we	con load - Total weight of	
				= 1750-550	SITISTODO E LUCYD	
				1 4 200 t		
		VD VD	lune avail	able = 1410-1060	River of M. W.	
	1 fanc	1278 281	163914 = [63	EC = 30380 m3)88		
		VO	lune = we	ight XS.F		
	. 170	11 3M- 94	350 = 320	OX(SF) DO TO	Konto anti 3	
				50/200301 groundy	***	
		·~ .	71:	75 m3/st = 0000		· Hov. I
	SO, OP	tional co	argo we com	wad on 270 is	200t of S.F 1.75 m3/t]	MOV. (
			52 381 t	= 29		
l bay				bags 2952-381	to on	
	On .	2LH, Wei	get available	e = 12:00 - 1000		
	-			= 200 t		
		TVO	lune avail	We = 1700-1250	STEEL NO 2 LH	
•		ne: 1910 o		= 450 m200		
	=150m ²	01×31 = 1	volume = w	eight X S FOOT - OF	NOTE OF STATE	_
	5t/m2	# Hizmb	book 50 =	200 X S.F 450/200	Lead donsity i	
8 Y 0 8	eag lead :	LO CRIMO	XOM S.F =	hizologad theological	PIOK CORGO LOE C	



n19 6	Max ^m displacement : 15700 mt					
	Light ship disp. = 3980					
	Initial bunker + $FW = (+)150$					
	Recieving bunker = (+)1300					
	Recieving FW = (+) 250					
	Disp. after above aps. = 5680 t					
	- Europe of the same topped or made to the					
	cargo can wad = 15700-5680					
	SEN: = 10020 t - 616-601					
	There are total 5 holds, sollies					
	cargo can load in each hold = 10020 = 2009t)					
	5					
	But, since it is a iron ore, we will check that if we load 2004+ in one					
	hold, theload density of tank top is not exceeding					
	cargo can load in one hold = areax density					
	$=20\times19\times7.5$					
	= 2400 t					
	& we are wading 2004t in each hold					
	That means, we are not exceeding the load density					
10V. 17 (7)	Bale capacity = 500 m ³					
	arain capacity = 570 m ³					
	Step 0: - volm of 1 bay = 0.5 x 0.4 x 0.3					
	$= 0.06 \mathrm{m}$					
	weight of 1 bag = 50 kgs = 0.05t					
	S.F = Vol/weight					
	$= 0.06/0.05 = 1.2 \text{m}^3/\text{t}$					
	New sif = Sift (Sifx Bs)					
	$=1.2+\left(1.2\times\frac{11}{100}\right)$					
	= 1.2 + D.132					
	$= 1.332 \text{ m}^3/\text{t}$					



Step@: vot of maire discharge = weight XSF	0 (0)	April 2200
= 100 X1.25		2 1
5, 125 m ³	100	similar:
step 3: vol available for bagged maize = 125 x 500 Similar of 12070	@1.025	E= 2·1 Eff: 59.513·6 = 36 mm
1981(4) = YEARING OF THE STOP IN OW OF Equivalent	displacement	March 19/ Jank
020(+) = M= 109.649 m3 = 12070	1.025	March 19, Jank E=0.825t Eff=50.51.1 D=18mm
Fish when above apr = 5680 t		July 18,
Step@: weight of bagged maize that can be coaded = ?		
cargo can wad 7.2 K the Bow 1201		
109.649 = weight x 1.332		
weight = 109:649/1332+ 300 93391		-
(17000 = 05001 = 1818-2:1319 to 1000 100 agras		
2	1	
Personce It is a honore, we can each there if we come we is a		
(163) Holera waster of the top is not exceeding		
curre con read in one hold= areax density		
Z-FXPIXOC = 7		
1.3018 =		
Luce are watering scent in each noise		
That prease, we are not exceeding the lead arms		
isale capacity = 500 m ³	FU	-
ciscuin capacity = 570 m3		
step 0. Vol of 1 bay c sx a. 4 x a 3		
= 0.060		
weight of 1 bag = 50 kgs = 0.05t		
S.t. volvegu		
1/5m s.1 = 20-0/200		
	-	_
NEW SIF = 5++ (SIFX (ST)		
(12×51)+51.		_
1.34 0.132		



Št.

bearing the same of the same o	
	Blocks and Purchases (2 purchase)
April 220	@ Effort required to lift the wad =? (2 purchase)
NOV 18	Two fold purchase
march 21, May !	10 ady $w = 13T$ no. of sheeve $n = 4$ $11 = opposite$ $11 = same$
E= 2·1 EH = 59.52 3·/)= 36 mm	velocity ratio, V.R = 170 (opposite)
March 19, Jan 19,	- 4
D=18mm	Effort, E = w + (n wx friction)
July 18,	Se x to se voc
	$= 13 + (4 \times 13) \times \frac{8}{100}$
	26.41.00 · 1 · 1 · 1 · 1 · 1 · 1 · 1 · 1 · 1 ·
	= 1354.16 = 17.16 = 4.29 t
	" (4) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1
	Gun tackle 21 x 120H2 225012 prisiosid
	w = 4.29t no of sheeve, $n = 2$
	velocity ratio, is R = 92 the some direction in the
	002 = 3
	Effort, E = 14.29 + (2×4.29) × 100
	902 3
	429 to 6864 = 4.9764 5
	44311 = 413 3
	$ \cos ps = 0$ = $ 1.659t $ i.e. final effort
	(b) Efficiency of the system = ? (1912) 301 +0 191900143 (1)
***	Efficiency of the system = VRX 10011
	2 - A. where managefort
	84 E.E = M:A = 13/1.659 = 7.836
	Final V. R = V. R of two fold purchasex v. R of gun tackle
	Hence, efficiency = 7.836 x 100
	= 65.3.1.
	@ Size of nylon rope required for gun tackle =?
	Breaking stress = S.W.L x F.S
-	= 1.659 × 6 = 9.954
	Breaking stress of Nylon rope = 502
	$9.954 = \frac{300}{53^2} 2986.2 53^2$ $300 D^2 = 597.24$ $D = 24.438 \sim 24 \text{ mm}$
_	D = 24.438 ~ 24mm



	BARCES AND PRINCE MA	
March Dec 22, 21, 2	Two-fold purchase (1 purchase + 1 block)	Feb 22, (5 sep 21,
OCT 21, OCT 20, July 19	$load_{\omega} = 26T$ $no.of_{\omega} = 4+2$ 2 sheepe	sep 21/
epp. ere	velocity ratio, v-R = n+D advantage = 6	*
similiar:-	velocity ratio, v-R = n+D advantage = 6 = 4+1 restriction = 5 [Some] = 5 (only of purchase)	- Similar:
March 18-may	Effort, E = w+ (nwx Friction)	JON 21, NOV 2
	effection w+ (Awk Frichan)	
	the second secon	
	= 26 + (5 × 26) × 8/100	
	100 D = 27.696+81	
	(a) Size of wire (6x 24) to be used =?	
	Breaking stress = S.W.L X F.S (DD)	
	2=00027.696×6 = 465176 0 pool	
	Breaking stress of 6x24 wire = 2002 the glosson	
	£ = 500	
	€ 1700 × (60 46:134 20) × 100	
	500	
	6 PAFB. 12 - VARA 230881= 2032	
	$\mathcal{D}^2 = 1154.4$	
fort	1 soul 3.1 test = 0 = 33.976 = 34mm	
	(b) Efficiency of the system = ? Efficiency of the system = M.A. x 100	
	Efficiency of the system = wina x 100	
	MA 200 Load/effort V.R = 5	
	386 F = 626.1 = 26/4696 = 3.378	*
	Efficiency = 3:378 x 100	
	301 x 368.5 5 5000000000000000000000000000000000	
-	[4.8.63]=	-
~~~	C = 100 of mylon office sedunization gyn facent = ?	
	Breaking Stress S. M. F. C. S. M. F. C. S. M. F. C. S. M. F. M. F. S. M. F.	
And the second s	ELECKOR States of Nylon rope = 5054	
	ELECTION Streets of NAION WAS - 200	
	interference of the second	
•		



a) As per code of safe working practise, we will consider the rope damagea
if 10% or more wire is broken within the 8 times of diameter.
* No. of wire in this rope = 6 x 36 = 216 wire
10.1. of this = 216×10 = 21.6 = 22 wire
& question says 22 wire is broken
that means, 10.1. of wire is broken, so, we reject
5414
* we will reject if 8 times of diameter is broken (length wise)
diameter of rope = 20mm
$length = 20 \times 8$ $= 160  \text{mm}$
& question says broken in length of 120mm
that mean, we can keep
3 (63) 0
But, if any of the condition will satisfy to reject
We will reject the wine rope text to ?
005
b) cyn tackie cic = 2800 Chisadvanioge
1 -4 - 0+ 00 of sheeps n=5 V.R = 5+(0) =5
Effort = WE(NWX Friction) VR = 5+0 = 6
50145 = 10 N.K
E = 9+(5x9)x 100+8+ 1 E = 9x(5x9) x 100
5
E = 9+4.5 = 217 to book DE H (215/5 ) 10/2/25/10
(saa, w= +1 6 no of speece, o= 6 v /2 (10 0)
Breaking stress = S.W.Lor X F.S effort X F.S
= 2.7 ×6 300 100 25×6
= 16.2 11 = 13.5
Breaking stress of 6x24 wire = 2002 (Fxd)
500
$16.12 = \frac{20.3^2}{500} \qquad 18.5 + \frac{90.3^2}{500}$
$p^2 = 9.05$ $p^2 = 337.5$
D = 20.125 ~ 22mm \$ 18.371 2 19mm

That we can see if whether at advantage or disadvantage



and the second s		
DOC 20 @	Three-fold purchase	
231	loady w= 2 tonnes no. of sheever n = 6	
SIMULUS . MOUIS	10 - 6 10 activating	and the same of th
F = 2 - 22 + 6 H = 30 0 / 2 = 20 mm	D CCCod 6 - WILCOMY CALLED	
*	VIR 10 10	
	€ = 2+ (6×2) × 100	
10/10/00/18	- My ord 2: one to have the of some is broken.	
-	E = 2+1.2	
	हार मात अंदेहत में हमायह के में में मात है। हिंहामार्का है। हार्मिक है।	
	E = 0.4571 = 310 = 10 = 19 + 10 min	
*	8 x x = degco)	
	6 Minimum size of rope = ?	
	Breaking stress = S.w.L or X.F.S. word tool	Jan 20 6
\	= 0.457 X.5	ي ۾ قبار
	toget of phaton #12:285itings and to poo Historia	
<u></u>	8-S of 6x37 wirea rope = 021-9309137 Head 304	
_	500	
- opinosis	2.285 = 2102	
	1000 10 = 91 - 1902 Street 11=2 V.K = 5+(0) = 1	
	1000000000000000000000000000000000000	
-	D = 7.376 ~ 8 mm	
-	2 7 3 10 min 4 3 1	
March 20, 6	Conn tackle safely lift a load of 7 thones all a	
May 19, 9	$load_1 \omega = 7 + no. of sheeve, n = 5                                 $	
	2 Exploses Ethors x Explose X Exploses 2	
	Effort = w+ (nwx Friction)	
	V.R Stoll	
	E = 7+ (5×7) × 10 000 100 100 100 100 100 100 100 10	
	6 305	
	E = 7 + 3.5 or $7 + 3.5$	
	E = 1.75 t	



The second second	when using gun tackle	
	when using fur touches	ntage
page a series of the series and	Wady w = ? no- of sheeve, n = 2	inguit ag
	when using gun tackle  Loady $w = ?$ no-of sheeve, $n = 2$ $v \cdot R = 2 + 0 = 3$ $= 2 + 8 = 2$	
	Effort = W+(NWX MCHON)	
	The same sing ViR in a risk part to	
	1.75 = $\omega + (2x\omega) \times \frac{10}{100}$	
	3	
	$5.25 = \omega + 0.2\omega$ $4.2 = \omega + 0.2\omega$	
	$5.25 = 1.2 \omega$ 4.2 = 1.2 \omega	
	$\omega = 4.375t$ $\omega = 3.5t$	
-	bcz question says maxim weight	
0120G	Cryntackle when he had building theme some of	advan
	load w= 2.5t no of sheeven= 5 VR= n+0	9401
		الندر
	Effort = w+(nwx friction)	(c)
	Effort = w+(nwx Friction) = 5+1  v.R	الندر
	Effort = w+(nwx friction)	الندر
	Effort = $\omega + (n\omega \times Friction) \times G$ $v \cdot R$ $E = \frac{1}{2} \cdot 5 + (5 \times 2 \cdot 5) \times \frac{9}{100}$	الندر
	Effort = $\omega + (n\omega \times Friction) \times G$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 2.5 + 1$ $\chi = 2.5 + 1$ $\chi = 2.5 + 1$	
	Effort = $\omega$ + ( $n\omega$ x Friction) x $\omega$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 2.5 + 1$ $\omega$ $\omega$ $\omega$ $\omega$ $\omega$ $\omega$ $\omega$	
	Effort = $\omega + (n\omega \times Friction) \times G$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{9}{100}$ $E = 2.5 + 1$ $E = 0.583 t$ $E = 0.583 t$	
	Effort = $\omega$ + ( $n\omega$ x Friction) x $\omega$ $v \cdot R$ $E = 2 \cdot 5 + (5 \times 2 \cdot 5) \times \frac{8}{100}$ $E = 2 \cdot 5 + 1$ $E = 0 \cdot 583 t$ Efficiency of the system = ?	
	Effort = $\omega$ + ( $n\omega$ x Friction) x $\omega$ $v \cdot R$ $E = 2 \cdot 5 + (5 \times 2 \cdot 5) \times \frac{8}{100}$ $E = 2 \cdot 5 + 1$ $E = 0 \cdot 583 t$ Efficiency of the system = ?  Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{V \cdot R} \times 100$	
	Effort = $\omega + (n\omega \times \text{Friction})$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 2.5 + 1$ $G$ E = 0.583 t  Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{VR} \times 100$ $M \cdot A = \frac{U0.00}{VR}$	
	Effort = $\omega + (n\omega \times \text{Friction}) \times \frac{5+1}{5}$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 0.583 \text{ t}$ Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{VR} \times 100$ $M \cdot A = \frac{U \cdot \alpha d}{e + 100}$ $M \cdot A = \frac{U \cdot \alpha d}{e + 100}$	الندر
	Effort = $\omega + (n\omega \times FncHon) \times \omega$ $v \cdot R$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 2.5 + 1$ $E = 0.583 t$ Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{V \cdot R} \times 100 \text{ mas}$ $M \cdot A = \frac{\omega \cdot ad}{\omega \cdot effort}$	
	Effort = $\omega + (n\omega \times \text{Friction}) \times \frac{5+1}{5}$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 0.583 \text{ t}$ Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{VR} \times 100$ $M \cdot A = \frac{U \cdot \alpha d}{e + 100}$ $M \cdot A = \frac{U \cdot \alpha d}{e + 100}$	الندر
	Effort = $\omega + (n\omega \times Friction) \times G$ $v \cdot R$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 0.583 t$ Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{VR} \times 100$ $M \cdot A = \frac{1000}{4} = \frac{1000}$	الندر
	Effort = $\omega + (n\omega \times FncHon) \times \omega$ $v \cdot R$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 2.5 + 1$ $E = 0.583 t$ Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{V \cdot R} \times 100 \text{ mas}$ $M \cdot A = \frac{\omega \cdot ad}{\omega \cdot effort}$	
	Effort = $\omega + (n\omega \times Friction) \times G$ $v \cdot R$ $v \cdot R$ $E = 2.5 + (5 \times 2.5) \times \frac{8}{100}$ $E = 0.583 t$ Efficiency of the system = ?  Efficiency of the system = $\frac{M \cdot A}{VR} \times 100$ $M \cdot A = \frac{1000}{4} = \frac{1000}$	الندر



6 size of terriene rope = ? Breaking stress = SWL or X FS  $= 0.583 \times 6$ 2 3.498 Breaking stress of terylene rope = 4D2  $3.498 = 40^{2}$ 300 1049.4 = 402  $D^2 = 262.35$ D= 16.197 ~ [17mm] What is the smallest purchase used to disadvantage that could be used to lift a 8-ton package recieved with a wire rope of s.w.12-80t Effort = w+(nwx) Friction) company with  $load_{w} = 8t$ ,  $v \cdot R = n$ , Effort = 2.80t  $2.80 = 8 + (8.n) \times \frac{8}{100}$ 2.8D1 = 8+0.641 1883 2.80n-0.641 = 8 5 may 2 3 th 10 10 min from 12 2.160 =18 15 = many of 1 good 1 n = 3.704 ~ 4 mond so, smallest purchase can be used is two fold purchase Espiciony - chiss xino 1 508 11