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Ø HKGHKO/MDC/MKODQ2 OT7KTODDE HDOC+ DXC EHB/DXOHH/WHTTWKT : HDTHTJTDWHXOWKEHDEOH/WKEHODXH OHDTD

3\ FKRORJ\ 3UHFLSLWDWLRQ 3\ FKRORJ\ XQLW) DOO : LQWHU b 4 XHHQË/8 QLYHUVLW\

,QVWUXFWRUV -HI E

-HQDOH' \P RQG %(G %$ + VKH KHU

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7KHUHDUHQR SUHUHTXLVLWHV IRU WKLVF RXUVH 1RWHWKDWWKLVFRXUVHKDVWKHIROORZLQJ H[FOXVLRQV
(;&/86,21 6 36<& 36<& 36<&

&2856(/2&$7,21

/HF XUHVDQGDE VQWKLVF RXUVHDUHG HBYHUHGRQ FDP SXVLQ. LQJV RQ 2 QWZUR ,I \RX DUHLQQHGRI DUHP RWH RQOQH F RXUVHRSWRQ SOHDVHHP DLOXJF KDLUSV\F #T XHHQVX F DRUDWLVWDQF H

$&. 12: /(' *(0(172) 7(55,725<

: HZRXOGOLNHWRDF KQRZOHG JHWKDWWKH4 XHHQË/FDE`0U™ T y—@Ð p

DQGSOD\ RQWKHVHDQG V

7RDF KQRZOHG JHWKLVWDGWLRQDOWUULRU LVWRUHFRJQL]HLWVORQJHUKLWRU RQHSUHGDWQJ WKHHWDE OWKP HQWRI WKHHDUOHWW(XURSHDQF RRQLHV ,WLVDOR WR DFNQRZOHG JHWKLVWWULUURU Ë/VLJQLØFDQFHIRUWKH,QGLJHQRXV SHRSOHVZKROLYHG DQGF RQWQXHWRDYH XSRQLWDQGZKRVHSUDFWLFHVDQGSUDXWHVZHUHWHGWRWKHDQG DQGF RQWQXHWRG MHOPHDWRSLQUHDWRQWKSWR WKHWWULUURU DQGLWVFRWKHULKDE WDQWVWRGD\ 7KH. LQJWRQ ,QGJHQRXVF PP XQLW F RQWQXHVWR UHÙHFWWKHDUHË/$QVKLQDDE INIDQG+ DXGHQRVDXQHHURRW 7KHUHIVDOR DVJQLØF QWW «WL/F PP XQLW DQGWKHUHDE) LUWSHPSOHIURP RWKU1 DWRQVDFURV7XUWH,VDQGSUHVHQW

6XP P DU] HWkHP DWRUDUHDVDQGWkHP HVRI SV\FKRORJ\

: HHN	&RQVFRXVQHVVDQG6OHHS
: HHN	$WWQWRQDQG0 HP RU\
: HHN	0 HP RU\
: HHN	/ DQJXDJH / DQJXDJH8 VH DQG' HYHORSP HQW
: HHN	&RJQLWLYH' HYHORSP HQW
: HHN	6RFLDODQG(P RWLRQDO' HYHORSP HQW
: HHN	$G HBMF HQF H(P HUJLQJ $G XOWKRRG DQG$JLQJ
: HHN	,QWHOOLJHQF HDQG' HFLVLRQ0 DNLQJ
: HHN	0 RWLYDWLRQDQG(P RWLRQ
: HHN	,QWUDF WQJ ZLWK 7RXJK &RQWQW6HO &DUH DQG: HOOQHVV
: HHN	3\F KRSDWKRORJ\ ,
: HHN	3\F KRSDWKRORJ\ ,,
: HHN	3\F KRSDWKRORJ\ 3\F KRSDWK\ DQG7KHUDSHXWF2 UHQWDWLRQV
: HHN	3HUVRQDOLW\
: HHN	6RFLDO7KLQNLQJ DQG3HRSOHIQ* URXSV
: HHN	5HODWLRQVKLSVDQG6HO ,G HBMF\

7(; 7%22.

7KHWM[WE IRN IRUMKLVFDW/LVDF XWRP L]HGRQOQH2 SHQ$FFHVVWM[WE IRN 7KLVWM[WERRNLVIUHH DQGDYDLODEOH WR\RXLQP XOWSOHIRUP DW/HJ \RXF DQYLHZ LWRQWKHZ HE G RZQORDGLWLQDYDULHW RI IRUP DW/DQG\RXFDQ DORF IRRRVHWRJHWWSULQWMGL\RXZLVK (DFKZHHN RQ4 OQNV\RXWR\RXUHDGLQJVWKURXJKD85/ ,I\RX ZXBBBBBEN HWR G RZQORDGDQGSULQWWKHSDJHVIRU\RXURZQSHUVRQDOXVH\RXDUHDEOHWRGRWKLV EXWQRWWRQWR QQQ

Z LWK WKH LQWHQWLRQ VHHNLQJ VROXWLRQV H[SRUWLQJ WRS EVLQDVFKRODUV P DQQHUDQGZ LWK RSHQQHVV IRU UHVSHF WXOG VF XVLRQ

5HP HP E HUWKDWWKHUHDUHP DQ\ KXP DQVRQWKHRWKHUVLG HRI WKHFRP SXWMUVFUHHQVLQWKLVFODVV DQGRXU GVF XVLRQE RUGLVRUYLUXDOFDVURRP VSDFH ,QWKHHYHQWWKDWP HVDJHLVSRWMGZ LWKRXWWKHLQWMQWRI VHHNLQJ VROXWLRQV H[SORULQJ WRSLF VQDVFKRODU P DQQHURUZ LWKRXWDQRSHQQHVVIRUUHVSHFWXOGLVFXVLRQ LW ZLOOE HUHP RYHG 3OHDVH VHHWKH QHWMT XHWMW SROLF\ E HRZ IRUP RUHLQIRUP DWRQb

<RX P D\ KDYHDSHUVRQDOT XHWMRQDULH SOHDVHG RQRWSRVWWKLVWR WKHGVF XVLRQERDUG IRU\RXURZ QSULYDF\ ,I \RX KDYHDT XHWMRQWKDWV\SHFØF WR\RUFLFXP VWDQFH SOHDVHVHQGLVWR36<& # T XHHQVX F DWR WKDW ZHF DQKHSILQDSULYDWMP DQQHU b

2 IILFH+ RXUV

0 D\ E HDUUDQJHG E\ DSSRLQWP HQWE\ ZULWLQJ WR36<& # T XHHQVX FD: HFDQKRGGRQQH HJ 6N\SH 7HP V RIØF HKRXUVE\ DSSRLQWP HQW URS LQRIØFHKRXUZ LOODOWR EHSURYLGHG DQGWKHVHZ LOOEH SRVWMGLQDZ LG HWRQRXUF RXUVHRQ4 KRP HSDJH

&RXUVH)HHGEDFN

$VWXDURXVRLQVG XQLQJ WKHF RXUVH VWXG HQWP D\ E HDVNHGWR WZN HSDUWLQDYDULHV RI IHHGEDFNDFWLYLWHV VXF KDVT XHVWRQDLUHVDQGH[LWMF NWV 7KLVIHHG EDNHQDE HØWKHWMP WR P DNHDQ\ DGMXVWP HQWVQHFHVVDU WR LP SURYH WKHRQDQH HØHFWLQHQVV$G GMWRQDOWXG EHWHHG E DNZLOOEHVRXJKWWKURXJKRXWWKH F RXUVH $OOXUH\ VDUHGUHF WVUHDWMGWRDFWLYLWHV DVVHVP HQW DQGRWKHUFRXUHP DWMDO7KDQVLQ DG DQF HIRUWKDULQJ \RXUIHHG E DWRMKDWZ HFDQP DNHDGXSWP HQW

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7KLVF RXUVHLQF XG MDYDULHV RI DVVHV P HQWWSHV

$VVHVP HQW

b&RP SRQHQW b HLJKW

' HF IRE HU([DP

$SULO([DP

: HHNO 2 QQH/ DE V

) DQO0 HJD/ DE 3HHU5HYLHZ $VLJQP HQW

: LQWHU0 HJD/ DE 3HHU5HYLHZ $VLJQP HQW

%RQXV5HVHDUF K3DUWF SDWRQ2 SSRUWXQLWLHV

72 7$/

1 RWH %RQXVSRLQWV F DQQRW F KDQJHDIDLOQJ JUDG HEQWR DSDVLQJ JUDG H

EXAMS

7KHUHZ LOOE H UHT XLUHG H[DP VLQWKLVFODVV RQHLQ' HFHP E HUDQGRQHLQ$ SULO7KHVHH[DP VDUHVFKHGXOHGE\ WKH5HJLVWDU

7KHH[DP VP D\ LQF XG HP XOWLSOHF KRLFH WXH IDOVH DQGP DWFKLQJ WSHT XHUE•™a L

VXSSRUWLQJ UHVRXUFH PDWHULDOV RU SHUVRQQHO 7XQLVLD 7XQLVLDQ

,I \RX DUH P RUH WKDQ PLQXWH ODWH IRU \RXU HHNO ODE \RX ZLOOE HP DUNHG DV DEVHQWDQG UHFHLYHD VFRUH RI IRUWKDWODE

7KHUHP D\ E HDWLP HZ KHQ\RX DUH XQDE HDWR DWWHQGDODE IRULP SRUWDQWUHDVRQV RUZ KHQ\RX DUHODWH 7R EXLG LQÙH[LE OLW IRUDOOWXG EWV LQDF FURRDQFHZ LWK) CP[LE HD HMJQ Z HZ LOOG IRS WKHCRZ HWV ZHHNO ODEVIRU HDF KWXG EWDWWKHHQGRI WKHF RXUVH 7KLV) CP[LE HD HMJQIHDXUHSUHFXGHV\RXUQHGWRXVHWKH) DFXOWÊ/ 5HT XHWWRU\$F DG FLF&RQLG HDWRQÍ: LWKRXW RFXP HQWDWRQÎ 3RUWO,I \RX KDYHDGRFXP HQWWG UHTXHWWRU P RUHWKDQ KRXUV SOHDVHG RXVHWKHDFDG FLF FRQLG HDWRQVSRUWOG MFUEHGEHOZ b

1 RWH <RX P XWWRQ0 DWWQGWKHODE\RX DUHVFKHG XHGIRUG JKWRP LWVLQVSDFH ,I \RX Z RXOGOLNHWR DWWQGD GILHUHQWODE VHF WRQDVDUHXOWRI DQH[WQXDWQJ FLUFXP WWDQFHSUHYHQWQJ\RU IURP DWWQGLQJ\RUODE VHF WRQ\RX P XWWUHSRUWDQH[WQXDWQJ FLUFXP WWDQFHWKURXJKWKH\$FDG FLF&RQLGHUDWRQV3RUWOOWRJDLQ DS] S U

"MEGA LAB" PEER-REVIEW ASSIGNMENTS

7KHUHZLOOEH PXOWLSOHDVVLJQPHQWVUHTXLUHGLQWKLVFRXUVH RQHHDFKWLP ZRUWKDWRWDO HDFK
7KHVH 0HJD/DE VDUHGHVLJQHGWRSURYLGHDQRSSRUWXQLW\RXWRDSSO\WKHVNLOO\RXDUHOHDUQLQJZLWKLQD
SHHUUHYLHZ FRQW[W7KHUHLVRQHDVVLJQPHQWLQWKHIDOODQGRQHLQWKHZLQWHU

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XQDXWKRUL]HGP DWHULDOY IDFXOWDWLRQ IRUJHU DQGIDOVLFDWLRQ DQGDUHDQWWKHWFDOWRWKHGHYHORSP HQWRI DQ DF GHPLF FRP PXQLW DW XHHQV * LYHQWKHVH-@@1VRQ

678' (176678' <,1* 2575$9(//,1* $%52$'

,I \RX SODQ WR WDYHOZ HVWRQJ0 UHF IR P HQGWKDW RX FRQ2UP ,QWUQHWDYDLODELOLW LQ\RXUKRWFRXQWU SURU WR G HDUXH ,QWKHSDWWXG EWLQRWKHUFRXQWLHVKDYHE HHQE RFNHGIURP DFFHVVLQJ FHUWDLQ ZHEVLWHV UHDYDQWR WKHLF RUVHV DVZHOOVRQ4 ,WV WKHUHVSRQVLE OW RI DOOWXG EWR ERRNWDYHODURXQG FRXUH Z RUN DVZHF DQRWF DQJHWKHIRUP DWRUMP LQJ RQDVWHVP HQWRUDWJQP HQWDVDUHXOWRI WDYHOSODQV

&$/&8/$725 32/,&<

$VQRWG LQ$F DG PLF5HJXODWRQ Í&DOXDWRUVDFFHSWE KDIRUXVHG XQLQJ TXL]]HV WWWVDQGH[DP LQDWRQV DUHWG QG6FHQF HWXG EWÎ

&2 3<5,* +7

&RXUHP DWULDYF HDWG E\ WKHF RXUHLQWXFWRULQFOXG QJ DOOWG M SUHVHQWDWRQV KDQGRXW WWW H[DP V DEQGWKUVP LODUF RXUHP DWULDY DUHWKHÐWHgRp ^GEEDP V

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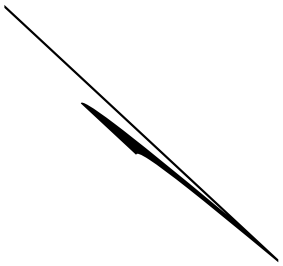

$&$' (0 ,& &2 1 6,' (5$7,2 1 6)2 5 678' (1 76,1 (; 7(1 8$7,1* &,5&8 0 67$1 &(6

$F IG FHLF F RQVLG HDWRQLVDSURF MVIRUWKHXQLYHUVLWV FRP P XQLW VR SURYLGHDFRP SDVVLRQDWHVRQVHVR DVVLWWXG HQVH[SHULHQF QJ XQIRUHVHHQ VKRUWWUP H[WQXDQJ FLUFXP WZQFHVWKDWP D\ LP SDFWRULP SHGHD WXG HQVËV/DE QDV VR F IR SOHMVWKHLUDF IG FHLFV 7KLVP D\ LQFOXG HE XWLVQRWQP LWG VR

- 6KRUWWUP SK\VLF IDRUP HQWZKHDWK LVXHV HJ VWRP DFK ÙX SQHXP RQLD &2 9,' GLDJQRVLV YDFFLQDWRQ HWF
- 5HVSRQVHVR WDXP DWF HYHQV HJ GHDWK RI DGRYHGRQH G YRUFH VH[XDODVDXOWVRFLDOQXWWFH HWF
- 5HT XLUHP HQWE\ QDZ RUSXE IGKHDOWK DXWKRULWHV HJ FRXUWG DHWZRDWRQGXHVR&2 9,' H[SRVXUH HWF

4 XHHQË/8 QLYHUVLWV LVF IR P LWWG VR SURYLG QJ DFDG FHLF FRQVLG HDWRQVR VXGHQWH[SHULHQFLQJ H[WQXDQJ F WF XR VWZQF MV) RUP RUHLQIRUP DWRQ SQHDVHVHHWKH6HQDW3RQF \RQ$F IG FHLF&RQVLG HDWRQIRU6VXG HQVLQ(H[WQXDQJ &LUF XR VWZQF MV

(DF K)DF XQV KDVG MVHQRSHGDSURVRF IRVR SURYLG HDFRQVLWWQWZQGHT XWZDE IGDSSURDFK LQGHDQJ Z LWK UHT XHWVWIRUDF IG FHLFF IRQVLG HDWRQIRUVXG HQVIDFLQJ H[WQXDQJ F WF XR VWZQF MV) RUP RUHLQIRUP DWRQ XQG HJUDG XZVWVXG HQVLQWKH) DF XQV RI $UWDQG6FLHQFHVVKRXGFRQVXOWWKH) DFXQËV HESDJH RQ$F IG FHLF&RQVLG HDWRQIQ(H[WQXDQJ &LUFXP VWZQF HVDQGVXE PLWDUHT XHWVYLDWKH$F IG FHLF &RQVLG HDWRQ5HT XHVW3RUWZO6WXG HQVLQRWKHU) DF XQVHVDQG6F IRRQZ KRUHHQURGHGLQWKLVFRXUHVKRXGG UHHUWR WKHSURVRF IRUWKHLUKRP H) DFXQV

6WXG HQVDUHHQF RXUDJHGWR VXE PLWUHT XHWVVDVRRQDVWKHQHGE IHRP HVDSSDUHQWDQGWR FRQWDFWWKHLU LQWWXF IRUDQG RUF RXUHF IRUG QDWRUDVRRQDVSRVVLE IHRQFH$FDG FHLF&RQVLGHUDWRQKDVEHHQJUDQWG \QG HDV LQF IRQWZF WW D\ OP LWWKHRSWRQVDYDLODE IHIRU$FDG FHLF&RVG HDWRQ

) RUP RUHLQIRUP DWRQRQWKH$F IG FHLF&RVG HDWRQSURFHVV Z KDWLVDQGLVQRWDQH[WQXDQJ F WF XR VWZQF HDQGWR VXE PLWD$F IG FHLF&RVG HDWRQUHT XHWVWSDHVHHWKH) DFXQV RI $UWDQG 6FIEQF IH$F IG FHLF&RQVLG HDWRQZ HE LWW

,I \RX QHHGWR UHT XHWVWF IG FHLF F IRQVLG HDWRQIRUWKLVFRXUH \RX Z LOOE HUHTXLUHGWR SURYLGHWKHQDP HDQG HP DLODG GHVV RI WKHILQWWXF IRUF IRUG QDWRU3 HDVHXVHWKHIRQOZ LQJ

,QWWXF IRU&RRUG QDWRU1 DP H 0 HJKDQ1 RUUV

,QWWXF IRU&RRUG QDWRUHP DLODG GHVV SV\F DF FIR# T XHQVX F D3 HDVHXVHWKLVHP DLO RUDQGF IG FHLF F IRQVLG HDWRQVDQGDF FIRRP RG DRQVUHDWWG LWXHV

81,9(56,7< 23(5$7,1* ' $7(6

6HS	7XLWRQG XH
6HS	&ODVVHVVWDUW
6HS	/ DWG \DWR DG GF RUHV
6HS	/ DWG \DWR G IRS F RUHVZ LWKRXWØQDQFLDOSHQDOW
7%	/ DWG \DWR VXE PLWDQH[DP DF FIRP RG DRQVUHT XHWV LI DSSQFFDE IH

(48,7<' ,9(56,7<$1' ,1&/86,9,7<67$7(0(17

4XHHQËV8QLYHUVLWUHFRQ]HVWKDWWKHYDQXHVRI HT XW DQGGYHUVLW DUHYLWDOWRDQGLQKDUPRQ\ ZLWKLW HGXFDWRQDOPLVLRQDQGVWZQGDGUHFHLQHFWDQGVWWPLF GVF LPLQDWRQH[LWWZLWKLQRXULQWWXWRQDOWWKFVXUHV SRQFLHVDQGSUDFWFHVDQGLQRXUFRP P XQLW 7KHVH WDNHP DQ IRUP VDQGZRUNVRGILHUHQWDOO DG WQWDJHSHUVRQVDFURVVRFLDOGHQWWHVXFK DVUDF HHWKQLF WV GVDE OW JHQG HILGHQWWV VH[XDORULHQWDWRQ IDWK DQGVRFLRHFRQP LF VWDWXV DP RQJ RWKHU H[DP SOHV WD