

# **ENGG2400**

AYWXUb]Wg°cZGc`]Xg°%

HYfa 'C bY''##'&\$&%

GWcc``cZ7]j ]`'UbX'9bj ]fcba YbHJ`'9b[ ]bYYf]b[ `'#'I BGK `'9b[ ]bYYf]b[

## 7 ci fgY<sup>·</sup>Cj Yfj ]Yk

## GHJZZ7cbHJWh78YHJ]`g

## 7 cbj Ybcfg

B Ua Y	9a U]`	5j U]`UV]`]m	@cWUh]cb	D∖cbY
8Ub]Y``CfG\YU	5 5	9aU]∵Zcf Uddc]bhaYbh	Fcca `&% ž < &\$	

GWXcc`7cbHJWhr=bZcfaUhjcb

## 7cifgY<sup>·</sup>8YHJ]`g

## 7 fYX]hDc]bhg<sup>·</sup>\*<sup>·</sup>

## Gi a a UfmcZh\Y'7ci fgY

H\]gʻWci fgYʻdfcj ]XYgʻUbʻ]bHfcXi Wijcbʻhcʻh\YʻZ bXUa YbHUʻgʻhcʻh\Yʻa YVXUb]WgʻcZgc`]Xg"ʻH\Yʻhcd]Wgʻ]bWi XY dfcdYff}YgʻcZd`UbY`Wfcgg!gYWijcbUʻ`g\UdYgʻ]bWi X]b[`WYbHfc]X´ df]bWjdU``gYWcbX`a ca YbhcZUfYU/ WcbWYdhgʻcZghfYggʻUbX`ghfU]b/&8`HfUbgZcfa UhjcbʻcZghfYggYgʻUbX`ghfU]bgʻi bXYfʻUl ]gʻfcHUhjcb/df]bVjdU` ghfYggYgʻUbX`ghfU]bg/A c\f\*gʻWjfWY`cZghfYggʻUbX`ghfU]b/ghfYgg!ghfU]b`fY`Uhjcbg\]dg/Y`UghjWjmž'h\Yfa U` ghfU]bžDc]ggcb\*gʻfUhjc`UbX`<cc\_Y\*gʻ@Uk /VUfgʻi bXYf`Ul ]U``ZcfWY/=bXYhYfa ]bUhY`Ul ]U``ZcfWY`gmghYa g/ Y`UghjWVYbX]b[`ghfYggʻZcfa i `U/Wca dcg]hY`VYUa g/XYZYWijcbgʻXi Y`hc`VYbX]b[/ghYdʻZ bWijcbg/g]a d`Y ]bXYhYfa ]bUhY`VYUa g/g\YUf`Zck /g\YUf`WfbHY/hcfg]cb`cZWjfW``Uf`g\UZg`UbX`Vcl``gYWijcbg"

## 7 ci fgY 5]a g

 $\mathsf{H} \ \mathsf{Y}^{\circ} \mathsf{C} \ \mathsf{V}^{\prime} \mathsf{W}^{\circ} \mathsf{J} \ \mathsf{Y} \ \mathsf{g}^{\circ} \mathsf{C} \ \mathsf{Z}^{\circ} \mathsf{h} \ \mathsf{J} \ \mathsf{g}^{\circ} \mathsf{W}^{\circ} \mathsf{i} \ \mathsf{f} \ \mathsf{g} \ \mathsf{Y}^{\circ} \mathsf{U} \mathsf{f} \mathsf{Y}.$ 

Hc`fY]bZcfWY`\_bck`YX[Y`cZgHUH]Wg`UbX`hc`YIdUbX`H\]g`\_bck`YX[Y`]b`H\Y`UfYUg`cZgHfU]b`UbX`gHfYgg UbU`mg]gž`H\ig`YbUV`]b[`ghiXYbh'hc`XYU``k]H\`acfY`Wcad`YI`UbX`]bHY[fUHYX`Yb[]bYYf]b[`dfcV`Yag`]bjc`j]b[ AYV\Ub]Wg`cZGc`]Xg/

Hc ']bhfcXi Wr 'gh XYbhg hc 'h\Y 'VUg]Wdf]bWjd Yg 'UbX ``Uk g'i bXYf m]b[ 'A YW Ub]Wg cZGc`]Xg/ Hc 'ZJa ]`]Uf]nY 'gh XYbhg k ]h\ 'h\Y a cXY``]b[ 'UbX 'UbU`mg]g 'hYW b]ei Yg 'k \Yb 'Zcfa i `Uhjb[ 'UbX'gc`j ]b[ dfcV`Ya g 'Zcf`dfYX]Wjb[ 'h\Y 'ghUhYg cZghYgg 'UbX'ghU]b 'Zcf`VcX]Yg ']b 'ghUhjWYei ]`]Vf]i a / Hc '[ ]j Y 'gh XYbhg 'Ub 'cddcfh b]mhc 'XYj Y`cd 'UbX'fYZYWicb '[ fUXi UhY 'Uhf]Vi hYg 'gi W. 'Ug Wf]hjWU`'h\]b\_]b[ 'UbX dfcV`Ya 'gc`j ]b[ ž`]ZY`cb[ `YUfb]b[ 'g\_]``g 'UbX'Wc ``UVcfUh]j Y 'g\_]``g"

## 7cifgY`@YUfb]b[`CihWcaYg

5ZhYfigi VWVggZ ``mWcad`Yh]b[ h\]giWcifgYžimci ig\ci`XiVYiUV`Yihc.

@YUfb]b[`CihWcaY	95 GHJ[Y % 7ca dYhYbW]Yg
%"8YacbghfUhY`U`WcadfY\Ybg]cb`cZh\Y`VUg]WWcbWYdhg`UbX`h\Y fc`Y`cZAYW\Ub]Wg`cZGc`]Xg`]b`h\Y`UbU`mg]g`UbX`XYg][b`cZ ghfiWnifYg	D9%"%ž <sup>`</sup> D9%"&
&"`8YacbghfUhY`U`WcadfY\Ybg]cb`cZh\Y`h\YcfYhJWU``VUW_[fcibX`hc h\Y`WcbWYdhicZghfYggYg`UbX`ghfU]bg/	D9%"
'"`6Y`UV`Y`hc`i bXYfgHJbX`UbX`Udd`mih\Y`WcbWYdhg`cZghfYggYg`UbX ghfU]bg`hc`Zcfa i `UhY`UbX`Yj U`i UhY`h\Y`ghfYggYg`UbX`XYZcfa Uh]cbg k]h\]b`UI]U``ZcfWY`UbX`VYbX]b[`a ca YbhidfcV`Ya g/	D9%" žD9%")
("`6Y`UV`Y`hc`YjU`iUhY`ghfYggYg`XiY`hc`UI]U``ZcfWYž'VYbX]b[ acaYbhž'g\YUf`UbX`hcfg]cb`]b`gmaaYhf]WU``UbX`ibgmaaYhf]WU` Wfcgg!gYWjcbg/VY`UV`Y`hc`WU`W``UhY`UbX`YjU`iUhY`VYUa`XYZYWjcbg Zcf`ghUh]WU``m`XYhYfa]bUhY`UbX`]bXYhYfa]bUhY`VYUag`Vmiig]b[ ]bhY[fUh]cb`aYh\cXg`UbX`ghYd`ZbWnjcbg/	D9%" žD9%") žD9&"%
)""6Y"UV`Y"hc"WU`W"`UhY"g\YUf"UbX"hcfg]cb"ghfYggYg"Xi Y"hc"g\YUf UbX"hcfg]cb"ZcfWYg"fYgdYW¶j Y`m⁄"	D9%"&ž`D9%"'

`YUfb]b[`f\UhWUb`VY`YZZYW¶j Y`mUggYggYX`]b`Ub`YI Ua `Ybj ]fcba YbhUbX`VYWUi gY`YI Ua g`\Uj Y`\][\ fY`]UV]`]hm'

Ghi XYbhgʻa i ghifYWY]jYʻ(\$i - ]bʻh\YʻZbUʻʻYI Ua ʻhcʻdUggʻh\YʻWci fgY

## 5HYbXUbWYFYei]fYaYbhg

## F Ygci fWg

#### DfYgWf]VYX F Ygci fWfg

HYI h/cc\_. "A YW.Ub]Wg`cZA UhYf]U`g. HYbh '9X]h]cb`]b`G=I b]hg"'! F 7 '<]VVY`Yfž`DYUfgcb`9Xi WUh]cb

#### FYWca a YbXYX FYgci fWYg

#### 7ci fgY 9j U`i Uh]cb UbX 8Yj Y`cda Ybh

H\Y'GW\cc``cZ7]j ]``UbX'9bj ]fcba YbHJ``9b[]bYYf]b[ 'Yj U`i UhYg'YUW\ Wci fgY'YUW\ 'h]a Y`]h]g'fi b'h\fci [\`f]Ł h\Y'A m9I dYf]YbW'`Gi fj YmgžUbX`f]]Ł: cW g'; fci d'A YYh]b[g"`5g'dUfhcZh\Y'A m9I dYf]YbW'`dfcWygžmci f gh XYbhYj U`i Uh]cbg'cb'j Uf]ci g'UgdYWg'cZh\Y'Wci fgY'UfY`[fUXYX/h\Y'7 ci fgY'7 ccfX]bUhcf'dfYdUfYg'U gi a a UfmfYdcfhZcf'h\Y'<YUX'cZGW\cc`"`5bmdfcV'Ya 'UfYUg'UfY']XYbh]ZJYX'Zcf'fYa YX]U``UW]cbž'UbX']XYUg Zcf'a U\_]b[ ']a dfcj Ya Ybhg'hc'h\Y'Wci fgY'UfY'bchYX'Zcf'UW]cb'h\Y'bYI hh]a Y'h\Uhh\Y'Wci fgY']g'fi b'': cW g ; fci d'A YYh]b[g'UfY'WcbXi WhX'Vmh\Y'Zci f!NYUf'A UbU[Yfg'fUWUXYa]WghUZE'Zcf'Ubmghi XYbhg'k \c'k]g\'nc UhYbXž']b'YUW\'mYUf'cZh\Y'W]j ]``UbX#cf'Ybj ]fcba YbHJ`Yb[]bYYf]b[ 'dfc[fUa g"'Ghi XYbhWca a Ybhg'cb'YUW\ Wci fgY'UfY'Wc``YWhYX'UbX'X]ggYa]bUhYX'hc'h\Y'@YWi fYfg'WcbWYfbYXž'bch]b[ 'Ubmdc]bhg'k \]W\'WUb'\Y'd ]a dfcj Y'h\Y'Wci fgY"

## Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

D`YUgY`fYZYf`hc`h\Y`A ccX`Y`dU[Y`cZh\Y`Wci fgY`Zcf`Z fh\Yf`[i]XUbWY`cb`UggYgga Ybhigi Va]gg]cb"

## 5WUXYa ]W<cbYghmUbX D`U[ ]Uf]ga

6Yk UfY ``5b`Ugg][ ba Ybhik Uhi]bWi XYg`d`U[ ]Uf]gYX`a UhYf]U``k ]```fYWY]j Y`U`\$ı - : U]`žUbX`ghi XYbhg`k \c d`U[ ]Uf]gY`a UmZJ]``h\Y`Wci fgY"`Ghi XYbhg`k \c`d`U[ ]Uf]gY`UfY`U`gc``]UV`Y`hc`X]gW]d`]bUfmUWf]cbž`]bWi X]b[ YI Wi g]cb`Zfca `Ybfc`a Ybh'

D`U[]Uf]ga `]g'h\Y`i gY`cZUbch\Yf`dYfgcb'g`k cf\_`cf`]XYUg`Ug`]Zh\Ymk YfY`mci f`ck b"`K \Yb`]h`]g`bYWYggUfmcf XYg]fUV`Y`hc`i gY`ch\Yf`dYcd`Y'g`a UhYf]U``mci `g\ci`X`UXYei UhY`mUW\_bck`YX[Y`k \cgY`k cfXg`cf`]XYUg`h\Ym UfY`UbX`k \YfY`mci `Zci bX`h\Ya`f[]j]b[`h\Y`Wci c Uf`dYcc`d`U[]Uf]gY`UfY`U`gc``]UV`Y`hc`X]gV]d`]bUfmUWf]cbž]b\

## 5₩UXYa]W=bZcfaUh]cb

<u>? Ymil BGK '8 UhYg</u>'! 'Y[ "'7 Ybgi g'8 UhYžYI Ua 'XUhYgž`UghXUmhc 'Xfcd'U'Wci fgY'k ]h\ci hUWUXYa ]W#]bUbW]U` `]UV]`]hmYhW'

#### : ]bU`9I Ua ]bUh]cbg.

: ]bU``YI Ua g`]b`HYfa `%k ]``VY`\Y`X`cb`]bY`VYfk YYb`' \$h\`5df]``!`% h\`A Um`]bWi g]j Y"`Mci `UfY`fYei ]fYX`hc`VY Uj U]`UV`Y`cb`h\YgY`XUfYg"`D`YUgY`Xc`bchhc`a U\_Y`UbmdYfgcbU``cf`hfUj Y``UffUb[ Ya Ybhg`Xi f]b[ `h\]g`dYf]cX"

#### Gi dd`Ya YbhUfm'9I Ua ]bUh]cbg.

Gidd`Ya YbHJfm'9I Ua ]bUh]cbg'Zcf`HYfa '%&\$&%k ]``VY`\Y`X`cb`&( h\`!`&, h\`A Um`]bWig]j Y`g\ci`X`mci`VY fYei ]fYX`hc`g]hcbY"`Nci`UfY`fYei ]fYX`hc`VY`UjU]`UV`Y`cb`h\YgY`XUhYg"`D`YUgY`Xc`bchhc`a U\_Y`UbmdYfgcbU` cf`hfUjY``UffUb[ Ya Ybhg`Xif]b[`h\]g`dYf]cX"

#### 57589A = 58J = 9

: cf`]bZcfa Uh]cb`UVci h

- BchYgʻcbʻUggYgga YbhgʻUbXʻd`U[]Uf]ga /
- GdYWJU``7cbg]XYfUh]cbg. <u>ghi XYbH'i bgk "YXi "Ui #gdYWJU`!Wcbg]XYfUh]cb</u>/
- •; h]\$ bX`d` d` cYW]U` \*₽]f i Xbg."

## 5ddYbX]I. '9b[]bYYfg'5ighfU`]U'f195ŁDfcZYgg]cbU`'9b[]bYYf'7cadYhYbWm GHJbXUfX

Dfc[fUa +bhybXYX @YUfb]b[ Cihwca Yq ? bck `YX[ Y 'UbX'q\_]``'VUqY D9%"%7cadfY\Ybq]i Yž'h\YcfmVUqYX'i bXYfqHUbX]b[ 'cZh\Y'i bXYfd]bb]b[ 'bUh fU`'UbX d/mg]WU`:gW]YbWYg`UbX`h\Y`Yb[]bYYf]b[`Z bXUa YbHU`g`Udd`]WUV`Y`hc`h\Y`Yb[]bYYf]b[`X]gW]d`]bY D9%"& 7 cbW/dhiU`i bXYfqHUbX]b[ cZh\Y`a Uh\Ya Uh\Wažbi a Yf]WU`UbU`mg]qžqHUh|qh\WažUbX Weadi hYf'UbX']bZcfaUh]cb'gW]YbWYg'k\]WX'i bXYfd]b'h\Y'Yb[]bYYf]b['X]gW[d`]bY D9%" + + XYdh i bXYfqHbX]b[ cZqdYWU`]qhVcX]YqcZ bck YX[Yk]h bhY'Yb[]bYYf]b[ X]qWd`]bY D9%"('8]qWFfba YbhcZ\_bck YX[YXY]Ycda YbhUbXfYqYUfWXX]fYWfcbg'k ]h.jb'h.Y Yb[]bYYf]b[`X]gWJd`]bY D9%") ? bck `YX[Y`cZYb[]bYYf]b[ `XYg][b`dfUW]WY`UbX`WcbhYl hi U``ZJW/cfg`]a dUWf]b[ `h\Y Yb[]bYYf]b['X]qW[d`]bY D9%"\* I bXYfqHJbX]b[ cZh\Y'qWcdYždf]bW]dYgžbcfa gžUWVci bHJV]]]h]Yg'UbX'Vci bXg'cZ qi qHU]bUV`Y`Yb[]bYYf]b[`dfUWfWY`]b`H\Y`qdYW[Z]WX]qW[d`]bY 9b[]bYYf]b['Udd`]WUhcb'UV]`]hm D9&"%5dd`]WUhjcb`cZYghUV`]g\YX'Yb[]bYYf]b[`a Yh\cXg`hc`Wca d`YI 'Yb[]bYYf]b[`dfcV`Ya qc`i]b[ D9&"&: `i YbhUdd`]WUhcb'cZYb[]bYYf]b[ 'hYWkb]ei Ygžhcc`g'UbX'fYgci fWfg D9&"' 5dd`]WUhjcb'cZgmghYa UhjWYb[]bYYf]b['gmbh\Yg]g'UbX'XYg][b'dfcWYggYg D9&"( '5dd`]WUHcb'cZgmghYaUHWUddfcUWXYg'hc'h\Y'WcbXiWiUbX'aUbU[YaYbhcZYb[]bYYf]b[ dfc Y₩q DfcZYgg]cbU`UbX dYfgcbU`Uhf]Vi hYg D9' "%'9h\]WU``WcbXi WiUbX'dfcZygg]cbU``UVWci bHUV]`]hm D9' "&'9ZYW)j Y'cfU`'UbX'k f]HYb'Wca a i b]WUh]cb']b'dfcZygq]cbU`'UbX'`UmXca U]bg D9' "' 7 fYUhi Yžibbci Uhi YUbX dfc!UWi YXYa YUbci f D9' "( DfcZygg]cbU`i gY'UbX'a UbU[ Ya YbhcZ]bZcfa Uhcb D9' ") CfXYfma UbU[Ya YbhcZgYZzUbX dfcZygq]cbU`WcbXi Wh D9' "\* 9ZYWAJ Y HYUa 'a Ya VYfg\]d UbX HYUa 'YUXYfg\]d