## **BIORESOURCE TECHNOLOGY (ChBC-82)** B.Tech. 8<sup>TH</sup> Semester

S. No.	Questio	ns			<u> </u>		<u>Jeine</u>						COs
1.	The lignin contents and higher heating values (HHV) for some of the biomass											CO4	
	samples are given in the following Table:												
	Biomass			Lignin (L)		HHV		HHV		HHV		Difference	
	Samples			easured		vt.%) <sup>db</sup>	,	wt.%) <sup>daf</sup>		(Calculate			
	Corn Stov	er	- (	vt.%) <sup>db</sup> 14.4	(1)	MJ/kg) 17.8	(	MJ/kg) 18.5		(MJ/kg) 17.7	)	-0.8	+
	Corncob			15.0		17.0		17.2		17.8		+0.6	1
	Sunflower	Shell		17.0		18.0		18.8		18.0		-0.8	+
		Beech Wood		21.9		19.2		19.5		18.4		-1.1	†
	Ailanthus Wood			26.2		19.0		19.4		18.9	-0.5		1
	Hazelnut Shell			42.5		20.2		20.5		20.1			†
	Wood Bark			43.8		20.5		20.8		20.1		-0.7	1
	Olive Husk			48.4		20.9		21.6		21.0		-0.6	†
	Walnut Shell			52.3		21.6		22.2		21.4		-0.8	1
	With the help of the above data, develop a mathematical model which correlates												
	higher heating values and the lignin contents.												
2.	After finding the mathematical correlation between HHV and L in question (1),												CO4
	determine the square of correlation coefficient (R <sup>2</sup> ) and also calculate percentage of average error, and what is the root mean square error (RMSE)?												
	Note: The correlation: RMSE = $\sqrt{\frac{1}{n}} \sum_{i=1}^{n} (Observed value - Predicted value)^2$ may												
	V · t-1												
2	be used.  The provimate and ultimate analyses results of some of the bioresources are												CO4
3.	The proximate and ultimate analyses results of some of the bioresources are given in the Table below:												CO4
	Biomass		e Delow:  oximate analysis  Ultimate analysis References								+		
									s o		1101		
			VM db		A db	С		N	S	0			
	Pine chips	<b>M</b> 7.6	VM <sup>db</sup> 72.4	FC db 21.6	<b>A</b> db 6	<b>C</b> 52.8	H 6.1	N 0.5	<b>S</b>		Masia		
	Pine chips Poplar	<b>M</b> 7.6	72.4	FC db 21.6	6	52.8	<b>H</b> 6.1	0.5	0.09	40.5		a (2007)	-
	Poplar	7.6 6.8	72.4 85.6	FC db 21.6 12.3	6 2.1	52.8 51.6	<b>H</b> 6.1 6.1	0.5	0.09	9 40.5 2 41.7	Miles	a (2007) s et al. (1995)	- - -
	Poplar Sawdust	M 7.6 6.8 34.9	72.4 85.6 84.6	FC db 21.6 12.3 14.3	6 2.1 1.1	52.8 51.6 49.8	H 6.1 6.1	0.5 0.6 0.5	0.09	9 40.5 1 2 41.7 1 2 43.7	Miles Tillm	a (2007) s et al. (1995) nan (2000)	- - - -
	Poplar Sawdust Willow	M 7.6 6.8 34.9	72.4 85.6 84.6 82.5	FC db 21.6 12.3 14.3 15.9	6 2.1 1.1 1.6	52.8 51.6 49.8 49.8	H 6.1 6.1 6 6.1	0.5 0.6 0.5 0.6	0.09 0.02 0.02 0.06	9 40.5 1 2 41.7 1 2 43.7 1 5 43.4 1	Miles Tillm Moila	a (2007) s et al. (1995) aan (2000) anen (2006)	- - - - -
	Poplar Sawdust	M 7.6 6.8 34.9	72.4 85.6 84.6 82.5	FC db 21.6 12.3 14.3 15.9	6 2.1 1.1 1.6	52.8 51.6 49.8 49.8	H 6.1 6.1 6 6.1	0.5 0.6 0.5 0.6	0.09 0.02 0.02 0.06	9 40.5 1 2 41.7 1 2 43.7 1 5 43.4 1	Miles Tillm Moila	a (2007) s et al. (1995) aan (2000) anen (2006)	- - - - -
	Poplar Sawdust Willow db: Dry bas	M 7.6 6.8 34.9 10.1 sis daf: I	72.4 85.6 84.6 82.5 Ory, ash-fi	FC db 21.6 12.3 14.3 15.9 ree basis, I	6 2.1 1.1 1.6 M:Moistr	52.8 51.6 49.8 49.8 ure, VM:	H 6.1 6.1 6 6.1 Volatile	0.5 0.6 0.5 0.6 Matter,	0.09 0.02 0.02 0.06 A: Asl	2 41.7 2 43.7 6 43.4 h, FC:Fixed	Miles Tillm Moila d Carl	a (2007) s et al. (1995) aan (2000) anen (2006)	- - - - -
	Poplar Sawdust Willow db: Dry bas Using th and HH	7.6 6.8 34.9 10.1 sis daf: I	72.4 85.6 84.6 82.5 Ory, ash-firelations g) = (1	FC db  21.6  12.3  14.3  15.9  ree basis, 1  : HHV  3.55×C <sup>2</sup>	6 2.1 1.1 1.6 M:Moistr (MJ/k) 2-232×	52.8 51.6 49.8 49.8 ure, VM: g) = (0. C-2230	H 6.1 6.1 6 6.1 Volatile 3536> ×H +	0.5 0.6 0.5 0.6 Matter, $\langle FC + 0 \rangle$ 51.2×	0.09 0.02 0.02 0.06 A: Asl 0.153 C×H	40.5 2 41.7 2 43.7 6 43.4 h, FC:Fixed 59×VM- I + 131×	Miles Tillm Moila d Carl	a (2007) s et al. (1995) nan (2000) nanen (2006) bon 078×Ash) + 20600)	- - - - -
	Poplar Sawdust Willow db: Dry bas Using th and HH based or	M 7.6 6.8 34.9 10.1 sis daf: 1 e corre V(kJ/k n proxi	72.4 85.6 84.6 82.5 Ory, ash-firelations elations g) = (2)	FC db  21.6  12.3  14.3  15.9  ree basis, I  : HHV  3.55×C <sup>2</sup> and ultim	6 2.1 1.1 1.6 M:Moistr (MJ/k) 2-232× nate an	52.8 51.6 49.8 49.8 ure, VM: g) = (0. C-2230 alyses,	H 6.1 6.1 6 6.1 Volatile 3536> ×H + respective	0.5 0.6 0.5 0.6 Matter, \$\forall FC + (\forall S1.2\times \text{ctive}, ]	0.09 0.02 0.02 0.06 A: Asl 0.153 C×H	9 40.5 2 41.7 2 43.7 5 43.4 h, FC:Fixed 59×VM- I + 131× ict the li	Miles Tillm Moila d Carl -0.00  N gnin	a (2007) s et al. (1995) nan (2000) nanen (2006) bon 078×Ash) + 20600) n contents	- - - -
	Poplar Sawdust Willow db: Dry bas Using th and HH' based or present	M 7.6 6.8 34.9 10.1 sis daf: 1 e corre V(kJ/k n proxi	72.4 85.6 84.6 82.5 Ory, ash-firelations elations g) = (2)	FC db  21.6  12.3  14.3  15.9  ree basis, I  : HHV  3.55×C <sup>2</sup> and ultim	6 2.1 1.1 1.6 M:Moistr (MJ/k) 2-232× nate an	52.8 51.6 49.8 49.8 ure, VM: g) = (0. C-2230 alyses,	H 6.1 6.1 6 6.1 Volatile 3536> ×H + respective	0.5 0.6 0.5 0.6 Matter, \$\forall FC + (\forall S1.2\times \text{ctive}, ]	0.09 0.02 0.02 0.06 A: Asl 0.153 C×H	9 40.5 2 41.7 2 43.7 5 43.4 h, FC:Fixed 59×VM- I + 131× ict the li	Miles Tillm Moila d Carl -0.00  N gnin	a (2007) s et al. (1995) nan (2000) nanen (2006) bon 078×Ash) + 20600)	- - - -
	Poplar Sawdust Willow db: Dry bas Using th and HH based or present question	7.6 6.8 34.9 10.1 sis daf: 1 e corre V(kJ/k n proxi in the (1).	72.4 85.6 84.6 82.5 Ory, ash-firelations elations g) = (() mate air bioreso	FC db  21.6  12.3  14.3  15.9  ree basis, 1  3.55×C <sup>2</sup> and ultimources b	6 2.1 1.1 1.6 M:Moistr (MJ/k) 7-232× ate an	52.8 51.6 49.8 49.8 ure, VM: g) = (0.0 C-2230 alyses, ng the	H 6.1 6.1 Volatile 3536> ×H + respectorrel	0.5 0.6 0.5 0.6 Matter, ×FC + (51.2× ctive, 1 ation of	0.09 0.02 0.02 0.06 A: Asl 0.155 C×H predidevel	9 40.5 2 41.7 2 43.7 6 43.4 h, FC:Fixed 59×VM- I + 131× ict the light	Miles Tillm Moila d Car -0.00  N gnin	a (2007) s et al. (1995) nan (2000) nanen (2006) bon 078×Ash) + 20600) n contents ne data in	
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4.	Poplar Sawdust Willow db: Dry bas Using th and HH based or present question Estimate the corre	M 7.6 6.8 34.9 10.1 sis daf: I e corre V(kJ/k n proxi in the (1). e the va	72.4 85.6 84.6 82.5  Ory, ash-firelations g) = (2 imate arbioresco	FC db  21.6  12.3  14.3  15.9  ree basis, I  3.55×C <sup>2</sup> and ultimources but the burces but the b	6 2.1 1.6 M:Moistre (MJ/k) 2-232× ate an oy usin for the	52.8 51.6 49.8 49.8 ure, VM: g) = (0.0 C-2230 alyses, ng the	H 6.1 6.1 Volatile 3536> XH + respectorrel correl	0.5  0.6  0.5  0.6  Matter,  FC + (  51.2×  ctive, 1  ation costs given	0.09 0.02 0.02 0.06 A: Asl 0.155 C×H predidevel	2 41.7 2 43.7 6 43.4 h, FC:Fixed 59×VM- I + 131× ict the light loped for the strength of	Miles Tillm Moila d Car -0.00 < N gnin or th	a (2007) s et al. (1995) ann (2000) anen (2006) bon 078×Ash) + 20600) n contents ae data in by using model.	
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4. CO1: CO2:	Poplar Sawdust Willow db: Dry bas Using th and HH based or present question Estimate the corre	M 7.6 6.8 34.9 10.1 sis daf: I e corre V(kJ/k n proxi in the (1). e the valuation tal und (energy knowled	72.4 85.6 84.6 82.5  Ory, ash-firelations g) = (1 mate and bioresconducts of quederstanding, environged)	FC db  21.6  12.3  14.3  15.9  ree basis, I  3.55×C <sup>2</sup> and ultimurces burners burners burners burners, pro-	6 2.1 1.1 1.6 M:Moistr  (MJ/k 2-232× ate an by usin for the biores oduct, s	52.8 51.6 49.8 49.8 ure, VM: g) = (0.0000000000000000000000000000000000	H 6.1 6.1 Volatile 3536> XH + respectorrel ources or find and its lity).	0.5  0.6  0.5  0.6  Matter,  FC + 6  51.2×  ctive, pation of given ding the applica	0.09 0.02 0.02 0.06 A: Asl 0.153 C×H predidevel in que e mations	40.5 2 41.7 2 43.7 6 43.4 h, FC:Fixed 59×VM- I + 131× ict the light of the second of the seco	Miles Tillm Moila d Carl -0.00  N gnin or th  (1) b cal	a (2007) s et al. (1995) ann (2000) anen (2006) bon 078×Ash) + 20600) n contents ae data in by using model.	
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