Non-Assessed 2FCMb Practice in Generating a Weibull Plot

You are given data (see below) for a ceramic material, determined in 3-point flexural strength tests conducted at a strain rate of 1×10^{-3} s^{-1}.

You are required to:

(i) Find out what are the sample standard deviation and coefficient of variation of a data set are defined as, and how to calculate these parameters.

(ii) Calculate the mean flexural strength, together with the sample standard deviation and
coefficient of variation for the flexural strength data.

(iii) Draw a graph of survival probability P_s against flexural strength, s. Use the mean rank P_s (survival probability) estimator.

(iv) Draw the corresponding Weibull graph for the material, using the mean rank P_s (survival probability) estimator, and tabulating all the relevant numerical data.

(v) Using the data from (iv), determine the Weibull modulus, m value for the material graphically using least-squares linear regression method to generate the “best-fit” trend-line, giving the regression equation and correlation coefficient R.

Given the number of data, it is recommended that while you check your calculations manually, you use a spreadsheet program such as Excel to tabulate the data, do the calculations, and plot the graphs.

3-Point Flexural Strength Data for a Ceramic (MPa)

412	495	148	324	236	274	407	137	449	330	303	219
476	452	370	119	426	425	231	464	403	161	245	360
410	175	281	116	287	142	223	134	428	415	201	495
174	287	255	277	401	339	253	454	467	279	290	490
101	225	157	449	221	393	187	407	221	459	252	228
241	337	281	454	379	454	211	194	255	255	226	109
276	237	101	481	144	338	301	460	494	347	158	411
106	435	112	392	161	228	226	449	393	242	286	127
207	116	440	256	218	259	343	473	482	466	268	422
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