HARYANA STAFF SELECTION COMMISSION
BAYS NO. 67-70, SECTOR-2, PANCHKULA - 134151
(Website: www.hssc.gov.in)

PUBLIC NOTICE

NOTICE TO THE CANDIDATES FOR NORMALISATION IN WRITTEN EXAMINATION (OMR BASED) OF COMMON ELIGIBILITY TEST (CET-2023), HARYANA FOR GROUP – D POSTS.

Reference Commission notice dated 20.09.2023 which was published in various newspapers and also available on HSSC website i.e. www.hssc.gov.in.

The written examination (OMR Based) of Common Eligibility Test (CET)-2023, Haryana for Group-D posts will be held on 21.10.2023 & 22.10.2023 (Morning & Evening Session). Normalisation procedure (As adopted by NTA) as per **Annexure 'A'** will be used for compilation of Normalized Marks. It is for information of all concerned.

Sd/-
Secretary
Haryana Staff Selection Commission
Panchkula

Place: Panchkula
Dated: 10th October, 2023

Annexed – 'A'

Procedure to be adopted for compilation of NORMALIZED SCORES for multi-session Papers in COMMON ELIGIBILITY TEST (CET) -2023 for Group-D Posts (Normalization procedure based on Percentile and Equi percentile method)

Need for Normalisation

Common Eligibility Test (CET)-2023 will be conducted in different shifts. Since the question paper for each shift will be different and it is quite possible that despite all best possible efforts of maintaining equivalence among various question papers, the difficulty level of these question papers administered in different sessions may not be the same or similar. Some of the candidates might have end up attempting a relatively tougher set of questions when compared to other sets. The candidates who attempted the comparatively tougher examination are likely to get lower marks as compared to those who attempted the easier one; the scores of the students across shifts are not directly comparable. There is a need for normalizing the marks across shifts to make them amenable to such comparisons.

A Committee headed by Senior Professor from Indian Statistical Institution Delhi and comprising of Senior Professors from Indian Institute of Technology Delhi and University of Delhi had detailed deliberations to arrive at this methodology.

The raw score of each candidate in each shift will be normalised using the ***Equi-percentile method,*** the raw score for each candidate appearing will be converted into **NTA *Score*** (Percentile Score & Normalized Score) using the following three steps.

Step1: Convert Raw Scores into Percentile Scores.

The percentiles are calculated separately for each shift.

1. Record the number of candidates who have appeared in a shift. Denote this number by *N*.
2. Sort all the candidates in one shift in decreasing order of their marks.
3. Note the *raw marks* for each candidate. Suppose this is denoted by *T*. Count the number of candidates in that shift whose raw scores are less than *or equal to T*. Denote this number by *m*.
4. The percentile score for this candidate is then calculated as:

$$\mathbf{P} = \frac{m}{N} * 100$$

Illustration:

Suppose that the examination is held in two different shifts, *S1* and *S*2, say. Consider six candidates A, *B, C, D, E* and *F* out of which *A, B, C* are from shift *S1* and the other three D, E and F are from shift *S2*.

Let the raw marks of the six candidates be x_A, x_B, x_C (shift *S1* marks) and y_D, y_E, y_F(shift *S*2 marks).

For candidates *A, B, C*, the percentiles are calculated using the total marks obtained by candidates appearing in shift *S*1 as explained above.

Similarly, for candidates *D, E, F*, the percentiles are calculated using the total marks obtained by candidates appearing in shift *S*2 as explained above.

Let the respective percentiles be denoted by $P_A, P_B, P_C, P_D, P_E, P_F$.

The above data is summarised in the following table. The terms in red colour indicate that these are the output of this step.

Shift S1			Shift S2		
Candidate	Raw score	Percentile	Candidate	Raw score	Percentile
A	x_A	P_A	D	y_D	P_D
B	x_B	P_B	E	y_E	P_E
C	x_C	P_C	F	y_F	P_F

Since the calculation for percentiles in any shift depends only on the data from that shift alone, there is a separate table for each shift.

Step2: Pull-back the percentiles to the marks scale for each session to get Normalised Score.

- The data across all sessions tabulated at the end of *step 1* is collated into a single table.
- The columns for the shift-wise raw score should be kept separate.
- All the records are then sorted in decreasing order of the percentiles.

Illustration (Continued):

In the illustrative example given above, suppose that the percentiles of the six candidates satisfy

$$P_E > P_A > P_C = P_F > P_B > P_D$$

Then the collated table would be as given below:

Candidate	Percentile	RawscoreS1	RawScoreS2
E	P_E	–	y_E
A	P_A	x_A	–
C&F	$P_C = P_F$	x_C	y_F
B	P_B	x_B	–
D	P_D	–	y_D

Candidate *C* from shift *S1* and candidate *F* from shift *S2* have the same percentile. The relevant entries under "*Raw Score S1*" and "*Raw ScoreS2*" are the actual raw scores x_C and y_F respectively. This has the obvious interpretation that marks x_C of shift *S1* are equivalent to marks y_F of shift *S2*.

Candidates *A* and *B*, appearing in shift *S1*, have a blank entry in column "*Raw Score S2*", as there is no corresponding candidate having exactly the same percentile from shift *S2*. Similarly, Candidates D and E, appearing in shift *S2*, have a blank entry in column "*Raw Score S1*", as there is no corresponding candidate having exactly the same percentile from shift *S1*.

- In the remaining part of this *Step 2*, the blank entries in the two "*Raw Score*" columns are filled up using linear interpolation.
- Consider a record (row) whose entry in the column "*Raw Score S1*" is blank. The blank will be replaced by the interpolated score X which is calculated as:

$$X = x_1 + \frac{x_2 - x_1}{p_2 - p_1}(P - p_1)$$

Where:

- *P* is the corresponding entry in "*Percentile*" column
- x_1 is the first *non-blank* entry BELOW *X*. i.e., $x_1 < X$ and there is no other non-blank entry in the column between x_1 and *X*.
-

- x_2 is the first *non-blank* entry ABOVE *X*. i.e.,$x_2 > X$ and there is no other non-blank entry in the column between x_2 and X.
- p_1 is the entry in the "*Percentile*" column corresponding tox_1 from the column "*Raw Score S1*".
- p_2 is the entry in the "*Percentile*" column corresponding to x_2 from the column "*Raw Score S1*".

Note that there may be several blank entries between x_1 and x_2.

- All the blank entries in column "*Raw Score S1*" can now be replaced by the interpolated values.
- The blank entries in column "*Raw Score S2*" are also replaced using a similar procedure.

Illustration (Continued):

The table in the illustrative example would look like the following, where the entries in red indicate the addition output at the end of this step.

Candidate	Percentile	Raw Score *S*1	Raw Score *S*2
E	P_E	X_E	y_E
A	P_A	x_A	Y_A
C&F	P_C=P_F	x_C	y_F
B	P_B	x_B	Y_B
D	P_D	X_D	y_D

Step3: Calculation of the Normalised *Score*

Now for each raw score *there is a score assigned to each percentile value for each session.* The ***Normalised score, Z,*** corresponding to a percentile value *P,* is calculated as:

$$Z = \text{Average of } (u_A, u_B, u_C, \dots\dots\dots u_t) = \frac{u_A + u_B + u_C + ,\dots + u_t}{t}$$

Where $u_A, u_B, u_C, \dots\dots\dots u_t$denote the raw scores corresponding to the percentile *P* in each of different sessions

Illustration (Continued):

The **final** table in the *illustrative example* would be as follows:

Candidate	Percentile	Raw Score*S*1	Raw Score*S*2	Normalized Score
E	P_E	X_E	y_E	$(X_E+y_E)/2$
A	P_A	x_A	Y_A	$(x_A+Y_A)/2$
C&F	P_C=P_F	x_C	y_F	$(x_C+y_F)/2$
B	P_B	x_B	Y_B	$(x_B+Y_B)/2$
D	P_D	X_D	y_D	$(X_D+y_D)/2$

Step-by-Step Procedure for Converting from Raw Score to Normalized Score: -

Example: Suppose a test was held in 4 phases of examinees as per details given below: -

(Allocation of Days and shifts were done randomly)

Session	Day	Shift	No of Candidates			Raw Score	
			Absent	Appeared	Total	Highest	Lowest
Session-1	Day-1	Shift-1	3974	28012	31986	200	-40
Session-2	Day-1	Shift-2	6189	32541	38730	194	-36
Session-3	Day-2	Shift-1	6036	41326	47362	188	-36
Session-4	Day-2	Shift-2	9074	40603	49677	200	-40
Total(Session-1 to Session-4)			25273	142482	167755	200	-40

i. Highest Raw Score and Percentile Score: -

Session	Total Candidates Appeared	Highest Raw Score	Candidates who scored EQUAL OR LESS THAN Highest Raw Score	Percentile Score	Remarks
Session-1	28012	200	28012	100.0000000 [(28012/28012) *100]	i.e., All the highest raw scores would be normalized to 100 Percentile Score for their respective session.
Session-2	32541	194	32541	100.0000000 [(32541/32541) *100]	
Session-3	41326	188	41326	100.0000000 [(41326/41326) *100]	
Session-4	40603	200	40603	100.0000000 [(40603/40603) *100]	

ii. Lowest Score and Percentile Score: -

Session	Total Candidates Appeared	Lowest Raw Score	Candidates who scored EQUAL OR LESS THAN Highest Raw Score	Percentile Score	Remarks
Session-1	28012	-40	1	0.0035699 [(1/28012) *100]	i.e., Percentile Score of all the lowest raw scores are different i.e., Percentile Score depend on the total number of candidates who have taken the examination for their respective session.
Session-2	32541	-36	1	0.0030730 [(1/32541) *100]	
Session-3	41326	-36	1	0.0024198 [(1/41326) *100]	
Session-4	40603	-40	1	0.0024629 [(1/40603) *100]	

Step1: Convert Raw Score into Percentile Score

The percentile score for this candidate is then calculated as:

$$Percentile\ Score = 100 \text{ x } \frac{No.of\ Candidates\ appeared\ from\ the\ session\ with\ raw\ score\ EQUAL\ TO\ OR\ LESS\ than\ T\ Score}{\text{Total No. of Candidates appeared in the session}}$$

Candidate	Raw Score S1	Percentile Score
A20020720	200	100
A20411664	192	99.969144
A20018569	190	99.831255
A20339879	184	99.732901
A20074407	180	99.432054
A20751862	88	88.654575
A20922992	48	74.137715
A21004667	40	69.290405
A21141123	22	52.135343
A25465232	8	30.675846
A26545946	6	27.584445
A25656543	2	24.886459
A26625216	1	22.351432
A26174451	0	19.997686
A25463225	-1	15.23523
A26598636	-6	11.104361
A26596462	-40	0.053034

Candidate	Raw Score S2	Percentile Score
B20123935	194	100
B20012622	192	99.9990405
B20656224	100	96.9671093
B20410215	42	69.2904047
B20236444	26	67.7672549
B20128586	14	46.3751151
B20001667	4	27.0887703
B20042147	2	23.9100399
B20051256	0	12.225608
B20481968	-2	11.6211621
B20091701	-12	10.4982563
B20549576	-14	10.3947421
B20098269	-30	10.2430506
B20071356	-36	0.053034

Candidate	Raw Score S3	Percentile Score
C20150694	188	100
C20087997	186	99.969144
C20121991	184	99.831255
C20058572	180	99.732901
C20060310	172	99.432054
C20008597	56	78.338974
C20430859	36	69.00182
C20518247	20	52.135343
C20045510	14	38.091932
C20860609	9	30.675846
C20861476	5	27.584445
C20512680	3	24.886459
C20069270	2	22.351432
C20355550	0	12.188701
C20549576	-3	11.23523
C26598636	-22	0.0539983
C26596462	-36	0.053034

Candidate	Raw Score S4	Percentile Score
D20479616	200	100
D20040337	194	99.9990405
D20467385	98	88.6545749
D20398094	44	68.9660903
D20428934	40	49.5097099
D20032939	32	46.3751151
D20690279	30	27.0887703
D20840699	28	23.9100399
D20084751	26	20.8800276
D21237483	24	12.1887008
D21077463	1	11.5349248
D20348188	-2	11.0243302
D25463225	-40	0.053034

Step2: Pull Back of the percentiles to the marks scale for each session to get Normalized marks.

Candidate	Percentile Score	Raw Score S1	Raw Score S2	Raw Score S3	Raw Score S4
A20020720=B20123935=C20150694=D20479616	100	200	194	188	200
B20012622=D20040337	99.99904053	-	192	-	194
A20411664=C20087997	99.9691438	192	-	186	-
A20018569=C20121991	99.8312554	190	-	184	-
A20339879=C20058572	99.7329013	184	-	180	-
A20074407=C20060310	99.4320538	180	-	172	-
B20656224	96.9671093	-	100	-	-
A20751862=D20467385	88.6545749	88	-	-	98
C20008597	78.3389742	-	-	56	-
A20922992	74.1377149	48	-	-	-
A21004667=B20410215	69.2904047	40	42	-	
C20430859	69.0018201	-	-	36	-
D20398094	68.9660903	-	-	-	44
B20236444	67.7672549	-	26	-	-
A21141123=C20518247	52.1353428	22	-	20	-
D20428934	49.50970986	-	-	-	40
B20128586=D20032939	46.37511514	-	14	-	32
C20045510	38.0919321	-	-	14	-
A25465232=C20860609	30.6758464	8	-	9	-
A26545946=C20861476	27.5844446	6	-	5	-
B20001667=D20690279	27.08877034	-	4	-	30
A25656543=C20512680	24.886459	2	-	3	-
B20042147=D20840699	23.91003991	-	2	-	28
A26625216=C20069270	22.3514324	1	-	2	-
D20084751	20.88002763	-	-	-	26
A26174451	19.9976858	0	-	-	-
A25463225	15.23523	-1	-	-	-
B20051256	12.225608	-	0	-	-
C20355550=D21237483	12.1887008	-	-	0	24
B20481968	11.62116211	-	-2	-	-
D21077463	11.53492478	-	-	-	1
C20549576	11.23523	-	-	-3	-
A26598636	11.1043613	-6	-	-	-
D20348188	11.0243302	-	-	-	-2
B20091701	10.49825625	-	-12	-	-
B20549576	10.39474209	-	-14	-	-
B20098269	10.2430506	-	-30	-	-
C26598636	0.0539983	-	-	-22	-
A26596462=B20071356=C26596462=D25463225	0.053034	-40	-36	-36	-40

In the remaining part of this Step2, the blank entries in the Raw Score Columns are filled up using following linear interpolation Formulae:

$$X = x_1 + \frac{x_2 - x_1}{p_2 - p_1}\,(P - p_1)$$

Candidate	Percentile Score	Raw Score S1	Raw Score S2	Raw Score S3	Raw Score S4
A20020720=B20123935=C20150694=D20479616	100	200	194	188	200
B20012622=D20040337	99.9990405	199.7512409	192	187.93781	194
A20411664=C20087997	99.9691438	192	171.96504	186	171.96504
A20018569=C20121991	99.8312554	190	167.63275	184	167.63275
A20339879=C20058572	99.7329013	184	164.54257	180	164.54257
A20074407=C20060310	99.4320538	180	155.09028	172	155.09028
B20656224	96.9671093	158.958447	100	158.4442	101.91063
A20751862=D20467385	88.6545749	88	82.580043	112.72997	98
C20008597	78.3389742	56.7810489	60.96241	56	69.707196
A20922992	74.1377149	48	52.158146	47.207694	58.184318
A21004667=B20410215	69.2904047	40	42	36.629757	44.889504
C20430859	69.0018201	39.6972017	38.968549	36	44.097997
D20398094	68.9660903	39.6597121	38.593224	35.966106	44
B20236444	67.7672549	38.4018305	26	34.828858	43.753534
A21141123=C20518247	52.1353428	22	17.231221	20	40.539799
D20428934	49.5097099	20.1081761	15.758363	18.878207	40
B20128586=D20032939	46.3751151	17.8496346	14	17.538962	32
C20045510	38.0919321	11.8814266	9.7051566	14	31.141031
A25465232=C20860609	30.6758464	8	5.8599046	9	30.371981
A26545946=C20861476	27.5844446	6	4.2570079	5	30.051402
B20001667=D20690279	27.0887703	5.2651195	4	4.6325597	30
A25656543=C20512680	24.886459	2	2.6143453	3	28.614345
B20042147=D20840699	23.9100399	1.6148289	2	2.6148289	28
A26625216=C20069270	22.3514324	1	1.7332164	2	26.97122
D20084751	20.8800276	0.374867	1.4813591	1.7104312	26
A26174451	19.9976858	0	1.3303305	1.5367886	25.79696
A25463225	15.23523	-1	0.5151508	0.5995493	24.70105
B20051256	12.225608	-4.6428439	0	0.0072632	24.008493
C20355550=D21237483	12.1887008	-4.6875164	-0.122119	0	24
B20481968	11.6211621	-5.3744647	-2	-1.785703	4.0338503
D21077463	11.5349248	-5.4788463	-2.767984	-2.057041	1
C20549576	11.23523	-5.8415966	-5.436905	-3	-0.760858
A26598636	11.1043613	-6	-6.602352	-3.222382	-1.529777
D20348188	11.0243302	-6.24622	-7.315066	-3.358377	-2
B20091701	10.4982563	-7.8647146	-12	-4.252322	-3.822101
B20549576	10.3947421	-8.1831815	-14	-4.428221	-4.180631
B20098269	10.2430506	-8.6498685	-30	-4.685987	-4.706027
C26598636	0.0539983	-39.9970333	-35.99943	-22	-39.99666
A26596462=B20071356=C26596462=D25463225	0.053034	-40	-36	-36	-40

Step3: Calculation of Normalized Score:

Z= Average of $(u_A, u_B, u_C, \ldots\ldots\ldots u_t) = \frac{u_A + u_B + u_C +,\ldots.+ u_t}{t}$

Candidate	Percentile Score	Raw Score S1	Raw Score S2	Raw Score S3	Raw Score S4	Normalised Marks
A20020720=B20123935=C20150694=D20479616	100	200	194	188	200	195.5
B20012622=D20040337	99.999041	199.7512409	192	187.9378	194	193.4223
A20411664=C20087997	99.969144	192	171.965	186	171.965	180.4825
A20018569=C20121991	99.831255	190	167.6327	184	167.6327	177.3164
A20339879=C20058572	99.732901	184	164.5426	180	164.5426	173.2713
A20074407=C20060310	99.432054	180	155.0903	172	155.0903	165.5451
B20656224	96.967109	158.958447	100	158.4442	101.9106	129.8283
A20751862=D20467385	88.654575	88	82.58004	112.73	98	95.3275
C20008597	78.338974	56.7810489	60.96241	56	69.7072	60.86266
A20922992	74.137715	48	52.15815	47.20769	58.18432	51.38754
A21004667=B20410215	69.290405	40	42	36.62976	44.8895	40.87982
C20430859	69.00182	39.6972017	38.96855	36	44.098	39.69094
D20398094	68.96609	39.6597121	38.59322	35.96611	44	39.55476
B20236444	67.767255	38.4018305	26	34.82886	43.75353	35.74606
A21141123=C20518247	52.135343	22	17.23122	20	40.5398	24.94276
D20428934	49.50971	20.1081761	15.75836	18.87821	40	23.68619
B20128586=D20032939	46.375115	17.8496346	14	17.53896	32	20.34715
C20045510	38.091932	11.8814266	9.705157	14	31.14103	16.6819
A25465232=C20860609	30.675846	8	5.859905	9	30.37198	13.30797
A26545946=C20861476	27.584445	6	4.257008	5	30.0514	11.3271
B20001667=D20690279	27.08877	5.2651195	4	4.63256	30	10.97442
A25656543=C20512680	24.886459	2	2.614345	3	28.61435	9.057173
B20042147=D20840699	23.91004	1.6148289	2	2.614829	28	8.557414
A26625216=C20069270	22.351432	1	1.733216	2	26.97122	7.926109
D20084751	20.880028	0.374867	1.481359	1.710431	26	7.391664
A26174451	19.997686	0	1.330331	1.536789	25.79696	7.16602
A25463225	15.23523	-1	0.515151	0.599549	24.70105	6.203938
B20051256	12.225608	-4.6428439	0	0.007263	24.00849	4.843228
C20355550=D21237483	12.188701	-4.6875164	-0.12212	0	24	4.797591
B20481968	11.621162	-5.3744647	-2	-1.7857	4.03385	-1.28158
D21077463	11.534925	-5.4788463	-2.76798	-2.05704	1	-2.32597
C20549576	11.23523	-5.8415966	-5.43691	-3	-0.76086	-3.75984
A26598636	11.104361	-6	-6.60235	-3.22238	-1.52978	-4.33863
D20348188	11.02433	-6.24622	-7.31507	-3.35838	-2	-4.72992
B20091701	10.498256	-7.8647146	-12	-4.25232	-3.8221	-6.98478
B20549576	10.394742	-8.1831815	-14	-4.42822	-4.18063	-7.69801
B20098269	10.243051	-8.6498685	-30	-4.68599	-4.70603	-12.0105
C26598636	0.0539983	-39.9970333	-35.9994	-22	-39.9967	-34.4983
A26596462=B20071356=C26596462=D25463225	0.053034	-40	-36	-36	-40	-38

The above method is based on the work: "Normalization of marks in multi-session examinations", Abhay G. Bhatt et al, CURRENT SCIENCE, Vol. 118, No. 1, 10 January 2020