PGDM (IBM), 2020-22
Quantitative Methods for Business Analytics
IN-308
Trimester – III, End-Term Examination: April 2021

Time allowed: 2 hrs 30 Min Max Marks: 50

Roll No: _____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means.** In case of rough work please use answer sheet.

Use the uploaded DataSet_HDI_2021 Excel file. This contains data for 189 countries of the world for the year 2019. The columns are as follows:

a) **country** **name of the country**
b) **hdi** **human development index – an index value between 0 and 1 indicating the HDI of the country**
c) **le** **average life expectancy at birth**
d) **expsch** **expected years of schooling**
e) **meansch** **mean years of schooling**
f) **gni** **gross national per capita income, at PPP in USD**

Import the data into a SPSS.sav file for the numerical questions in this paper.

Section – A

SECTION A – (10 marks * 2 questions) = 20 Marks

Question A1a **(CILO 1)**

You have been approached by the editor of Gentlemen's Magazine to carry out a research study. The magazine has been unsuccessful in attracting shoe manufacturers as advertisers. When the sales force tried to secure advertising from show manufacturers, they were told men's clothing stores are a small and dying segment of their business. Since Gentlemen's Magazine goes chiefly to men's clothing stores, the manufacturers reasoned that it was, therefore, not a good vehicle for their advertising. The editor believes that a survey (via mail questionnaire) of men's clothing stores in the United States will probably show that these stores are important outlets for men's shoes, and are not declining in importance as show outlets. He asks you to develop a proposal for the study and submit it to him. Develop the management-research question that will help you to develop a scientific proposal.

OR

Question A1b

Create a new categorical variable to classify all the countries into four development levels according to the following rule.

HDI value range	Level description	Value
Greater than or equal to 0.800	Very High	V
>= 0.700 & less than 0.800	High	H
>= 0.550 & less than 0.700	Medium	M
Less than 0.550	Low	L

Find out, using an appropriate test if the per capita GNI is different for the Very High Developed countries and the High Developed countries.

Find out if the expected years of schooling varies across the developmental levels.

Question A2a **(CILO 2)**

a. A B-School is interested in finding out if students with prior work experience do better than students without previous experience. Explain the process of formulating of hypothesis, data collection and drawing conclusions relating to the research question.
b. What are the common types of errors encountered in defining research problem? What can be done to reduce the incidence of such errors?

OR

Question A2b

Create levels of GNI, V, H, M, L as follows.

GNI value range	Level description	Value
Greater than or equal to 20000	Very High	V
>= 7500 & less than 20000	High	H
>= 3500 & less than 7500	Medium	M
Less than 3500	Low	L

Also create levels of life expectancy, V, H, M, L as follows.

Life Expectancy value range	Level description	Value
Greater than or equal to 75	Very High	V
>= 70 & less than 75	High	H
>= 65 & less than 70	Medium	M
Less than 65	Low	L

Using these categorical variables or otherwise, find out if the per capita GNI and average life expectancy of a country are independent.

Question A3a **(CILO 3)**

A B-School is interested in finding out if students with prior work experience do better than students without previous experience. Explain the process of formulating of hypothesis, data collection and drawing conclusions relating to the research question.

OR

Question A3b

A fashion student was interested in factors that predicted the salaries of catwalk models. She collected data from 231 models. For each model she asked them their salary per day on days when they were working (**salary**), their age (**age**), how many years they had worked as a model (**years**), and then got a panel of experts from modelling agencies to rate the attractiveness of each model as a percentage with 100% being perfectly attractive (**beauty**). The data are in the file S**upermodel.sav**. Unfortunately, this fashion student bought some substandard statistics text book and so doesn't know how to analyse her data ☺. Can you help her out by conducting a multiple regression?

a) What is the regression equation? Which variables predict a model's salary? How accurate is the regression model?
b) What is the predicted salary of the model if her age is 24 years and has worked 7.2 years as a model and the panel of experts rated her 89.20 % attractive?
c) What is the relative importance of independent variables in the regression equation? State the nature of relationships of IDVs with dependent variable (DV)?

Section B: Case **(20 Marks:** Part marks: 6+6+8**)** **(CILO 1 & 3)**

a) Using linear regression models with gni as the dependent / research variable find out which of the variables, viz. expected years of schooling (expsch) or mean years of schooling (meansch) is a better (more significant) predictor. Comment on, and compare the two regression models.
b) Does the mean gni significantly differ with the developmental level of the country?
   i. What test are you using and why?
   ii. What is the hypothesis being tested?
   iii. What is the test statistic, and the observed significance of the test, and your conclusion?
c) Using the more significant of the two predictor variables, expsch and meansch, create and comment on the separate regression models for countries in each of the 4 developmental levels.

Note that you are to develop 2 regression models for part (a) and four for part (b) of this question.

country	hdi	le	expsch	meansch	gni
Norway	0.957	82.4	18.1	12.9	66494
Ireland	0.955	82.3	18.7	12.7	68371
Switzerlanc	0.955	83.8	16.3	13.4	69394
Hong Kong,	0.949	84.9	16.9	12.3	62985
Iceland	0.949	83	19.1	12.8	54682
Germany	0.947	81.3	17	14.2	55314
Sweden	0.945	82.8	19.5	12.5	54508
Australia	0.944	83.4	22	12.7	48085
Netherland	0.944	82.3	18.5	12.4	57707
Denmark	0.94	80.9	18.9	12.6	58662
Finland	0.938	81.9	19.4	12.8	48511
Singapore	0.938	83.6	16.4	11.6	88155
United King	0.932	81.3	17.5	13.2	46071
Belgium	0.931	81.6	19.8	12.1	52085
New Zealar	0.931	82.3	18.8	12.8	40799
Canada	0.929	82.4	16.2	13.4	48527
United Stat	0.926	78.9	16.3	13.4	63826
Austria	0.922	81.5	16.1	12.5	56197
Israel	0.919	83	16.2	13	40187
Japan	0.919	84.6	15.2	12.9	42932
Liechtenste	0.919	80.7	14.9	12.5	131032
Slovenia	0.917	81.3	17.6	12.7	38080
Korea (Rep	0.916	83	16.5	12.2	43044
Luxembour	0.916	82.3	14.3	12.3	72712
Spain	0.904	83.6	17.6	10.3	40975
France	0.901	82.7	15.6	11.5	47173
Czechia	0.9	79.4	16.8	12.7	38109
Malta	0.895	82.5	16.1	11.3	39555
Estonia	0.892	78.8	16	13.1	36019
Italy	0.892	83.5	16.1	10.4	42776
United Aral	0.89	78	14.3	12.1	67462
Greece	0.888	82.2	17.9	10.6	30155
Cyprus	0.887	81	15.2	12.2	38207
Lithuania	0.882	75.9	16.6	13.1	35799
Poland	0.88	78.7	16.3	12.5	31623
Andorra	0.868	81.9	13.3	10.5	56000
Latvia	0.866	75.3	16.2	13	30282
Portugal	0.864	82.1	16.5	9.3	33967
Slovakia	0.86	77.5	14.5	12.7	32113
Hungary	0.854	76.9	15.2	12	31329
Saudi Arabi	0.854	75.1	16.1	10.2	47495
Bahrain	0.852	77.3	16.3	9.5	42522
Chile	0.851	80.2	16.4	10.6	23261
Croatia	0.851	78.5	15.2	11.4	28070
Qatar	0.848	80.2	12	9.7	92418
Argentina	0.845	76.7	17.7	10.9	21190
Brunei Darı	0.838	75.9	14.3	9.1	63965
Montenegr	0.829	76.9	15	11.6	21399
Romania	0.828	76.1	14.3	11.1	29497

Palau	0.826	73.9	15.8	12.5	19317
Kazakhstan	0.825	73.6	15.6	11.9	22857
Russian Fe	0.824	72.6	15	12.2	26157
Belarus	0.823	74.8	15.4	12.3	18546
Turkey	0.82	77.7	16.6	8.1	27701
Uruguay	0.817	77.9	16.8	8.9	20064
Bulgaria	0.816	75.1	14.4	11.4	23325
Panama	0.815	78.5	12.9	10.2	29558
Bahamas	0.814	73.9	12.9	11.4	33747
Barbados	0.814	79.2	15.4	10.6	14936
Oman	0.813	77.9	14.2	9.7	25944
Georgia	0.812	73.8	15.3	13.1	14429
Costa Rica	0.81	80.3	15.7	8.7	18486
Malaysia	0.81	76.2	13.7	10.4	27534
Kuwait	0.806	75.5	14.2	7.3	58590
Serbia	0.806	76	14.7	11.2	17192
Mauritius	0.804	75	15.1	9.5	25266
Seychelles	0.796	73.4	14.1	10	26903
Trinidad an	0.796	73.5	13	11	26231
Albania	0.795	78.6	14.7	10.1	13998
Cuba	0.783	78.8	14.3	11.8	8621
Iran (Islami	0.783	76.7	14.8	10.3	12447
Sri Lanka	0.782	77	14.1	10.6	12707
Bosnia and	0.78	77.4	13.8	9.8	14872
Grenada	0.779	72.4	16.9	9	15641
Mexico	0.779	75.1	14.8	8.8	19160
Saint Kitts a	0.779	74.8	13.8	8.7	25038
Ukraine	0.779	72.1	15.1	11.4	13216
Antigua an	0.778	77	12.8	9.3	20895
Peru	0.777	76.7	15	9.7	12252
Thailand	0.777	77.2	15	7.9	17781
Armenia	0.776	75.1	13.1	11.3	13894
North Mac	0.774	75.8	13.6	9.8	15865
Colombia	0.767	77.3	14.4	8.5	14257
Brazil	0.765	75.9	15.4	8	14263
China	0.761	76.9	14	8.1	16057
Ecuador	0.759	77	14.6	8.9	11044
Saint Lucia	0.759	76.2	14	8.5	14616
Azerbaijan	0.756	73	12.9	10.6	13784
Dominican	0.756	74.1	14.2	8.1	17591
Moldova (F	0.75	71.9	11.5	11.7	13664
Algeria	0.748	76.9	14.6	8	11174
Lebanon	0.744	78.9	11.3	8.7	14655
Fiji	0.743	67.4	14.4	10.9	13009
Dominica	0.742	78.2	13	8.1	11884
Maldives	0.74	78.9	12.2	7	17417
Tunisia	0.74	76.7	15.1	7.2	10414
Saint Vince	0.738	72.5	14.1	8.8	12378
Suriname	0.738	71.7	13.2	9.3	14324
Mongolia	0.737	69.9	14.2	10.3	10839

Botswana	0.735	69.6	12.8	9.6	16437
Jamaica	0.734	74.5	13.1	9.7	9319
Jordan	0.729	74.5	11.4	10.5	9858
Paraguay	0.728	74.3	12.7	8.5	12224
Tonga	0.725	70.9	14.4	11.2	6365
Libya	0.724	72.9	12.9	7.6	15688
Uzbekistan	0.72	71.7	12.1	11.8	7142
Bolivia (Plu	0.718	71.5	14.2	9	8554
Indonesia	0.718	71.7	13.6	8.2	11459
Philippines	0.718	71.2	13.1	9.4	9778
Belize	0.716	74.6	13.1	9.9	6382
Samoa	0.715	73.3	12.7	10.8	6309
Turkmenist	0.715	68.2	11.2	10.3	14909
Venezuela	0.711	72.1	12.8	10.3	7045
South Afric	0.709	64.1	13.8	10.2	12129
Palestine, S	0.708	74.1	13.4	9.2	6417
Egypt	0.707	72	13.3	7.4	11466
Marshall Is	0.704	74.1	12.4	10.9	5039
Viet Nam	0.704	75.4	12.7	8.3	7433
Gabon	0.703	66.5	13	8.7	13930
Kyrgyzstan	0.697	71.5	13	11.1	4864
Morocco	0.686	76.7	13.7	5.6	7368
Guyana	0.682	69.9	11.4	8.5	9455
Iraq	0.674	70.6	11.3	7.3	10801
El Salvador	0.673	73.3	11.7	6.9	8359
Tajikistan	0.668	71.1	11.7	10.7	3954
Cabo Verde	0.665	73	12.7	6.3	7019
Guatemala	0.663	74.3	10.8	6.6	8494
Nicaragua	0.66	74.5	12.3	6.9	5284
Bhutan	0.654	71.8	13	4.1	10746
Namibia	0.646	63.7	12.6	7	9357
India	0.645	69.7	12.2	6.5	6681
Honduras	0.634	75.3	10.1	6.6	5308
Bangladesh	0.632	72.6	11.6	6.2	4976
Kiribati	0.63	68.4	11.8	8	4260
Sao Tome a	0.625	70.4	12.7	6.4	3952
Micronesia	0.62	67.9	11.5	7.8	3983
Lao People	0.613	67.9	11	5.3	7413
Eswatini (K	0.611	60.2	11.8	6.9	7919
Ghana	0.611	64.1	11.5	7.3	5269
Vanuatu	0.609	70.5	11.7	7.1	3105
Timor-Lest	0.606	69.5	12.6	4.8	4440
Nepal	0.602	70.8	12.8	5	3457
Kenya	0.601	66.7	11.3	6.6	4244
Cambodia	0.594	69.8	11.5	5	4246
Equatorial	0.592	58.7	9.7	5.9	13944
Zambia	0.584	63.9	11.5	7.2	3326
Myanmar	0.583	67.1	10.7	5	4961
Angola	0.581	61.2	11.8	5.2	6104
Congo	0.574	64.6	11.7	6.5	2879

Zimbabwe	0.571	61.5	11	8.5	2666
Solomon Is	0.567	73	10.2	5.7	2253
Syrian Arab	0.567	72.7	8.9	5.1	3613
Cameroon	0.563	59.3	12.1	6.3	3581
Pakistan	0.557	67.3	8.3	5.2	5005
Papua New	0.555	64.5	10.2	4.7	4301
Comoros	0.554	64.3	11.2	5.1	3099
Mauritania	0.546	64.9	8.6	4.7	5135
Benin	0.545	61.8	12.6	3.8	3254
Uganda	0.544	63.4	11.4	6.2	2123
Rwanda	0.543	69	11.2	4.4	2155
Nigeria	0.539	54.7	10	6.7	4910
CÃ´te d'Ivo	0.538	57.8	10	5.3	5069
Tanzania (U	0.529	65.5	8.1	6.1	2600
Madagasca	0.528	67	10.2	6.1	1596
Lesotho	0.527	54.3	11.3	6.5	3151
Djibouti	0.524	67.1	6.8	4.1	5689
Togo	0.515	61	12.7	4.9	1602
Senegal	0.512	67.9	8.6	3.2	3309
Afghanistar	0.511	64.8	10.2	3.9	2229
Haiti	0.51	64	9.7	5.6	1709
Sudan	0.51	65.3	7.9	3.8	3829
Gambia	0.496	62.1	9.9	3.9	2168
Ethiopia	0.485	66.6	8.8	2.9	2207
Malawi	0.483	64.3	11.2	4.7	1035
Congo (Der	0.48	60.7	9.7	6.8	1063
Guinea-Biss	0.48	58.3	10.6	3.6	1996
Liberia	0.48	64.1	9.6	4.8	1258
Guinea	0.477	61.6	9.4	2.8	2405
Yemen	0.47	66.1	8.8	3.2	1594
Eritrea	0.459	66.3	5	3.9	2793
Mozambiqu	0.456	60.9	10	3.5	1250
Burkina Fas	0.452	61.6	9.3	1.6	2133
Sierra Leon	0.452	54.7	10.2	3.7	1668
Mali	0.434	59.3	7.5	2.4	2269
Burundi	0.433	61.6	11.1	3.3	754
South Suda	0.433	57.9	5.3	4.8	2003
Chad	0.398	54.2	7.3	2.5	1555
Central Afri	0.397	53.3	7.6	4.3	993
Niger	0.394	62.4	6.5	2.1	1201