8535-IISSTA(Pr)-M-18

M.A./M.Sc. DEGREE EXAMINATION MAY 2018.

Second Semester

(CBCS)

STATISTICS

Paper STCP 2.1 – PRACTICALS BASED ON STCT 2.1

Time : Two hours Maximum : 30 marks

Answer any **TWO** questions.

Each question carries **15** marks.

1. (a) Every day a student walks from his home to road and requests a two wheeler rider going on the road towards his college for lift. Number of riders he requested to get lift, for 200 days, are recorded as follows :

No. of rider that he requested (X) :	1	2	3	4	5	6
No. of days (f) :	140	42	12	3	2	1

Fit a geometric distribution and test the goodness of fit.

(b) Suppose 7 cars are racing. The finishing time for the cars are i.i.d variables, each with density

$f(x) = \sin(x)$, for $x \in [0, \pi/2]$.

Find the probability that the 2nd place car arrives after time 1. (12 + 3 = 15)

2. (a) Contracts for two construction jobs are randomly assigned to one or more of three firms, A, B, C. Let Y_1 denote the number of contracts assigned to firm A, Y_2 the number of contracts assigned to firm B. Recall that each firm can receive 0, 1, or 2 contracts. Find the joint probability function Y_1 and Y_2.

(b) Gamma - distributed annual runoff. The annual runoff in the Cave Creek watershed near Fort Spring, Kentucky, USA are given as follows in millimeters over an 17 year period :

337 84 394 361 538 196 448 582 480 326 294 385 264 458 413 299 455

Assuming independence and a gamma distribution for the annual runoff, Determine the probability that the runoff will be greater than 100 mm in a given year.

(c) The study of divorced cases in the western countries, the following distribution is obtained for the time interval (in years) between the day of their marriage and day of their divorce.

No. of years :	0–3	3–6	6–9	9–12	12-15	15 & above
No. of persons :	190	70	25	10	4	1

Fit an Exponential distribution and test the goodness of fit. (3 + 4 + 8 = 15)

3. (a) Write a program to generate random numbers with a binomial distribution with parameters 8 and 0.6.

(b) If five dice are thereon 10000 times, estimate by simulation the number of times three or more sixes will occur.

(c) Find the marginal densities, conditional densities and $\rho(X, Y)$, for given

$$f_{x,y}(x, y) = \frac{3x + y}{4} e^{-x-y}, \; x > 0, \; y > 0 .$$ (4 + 4 + 7 = 15)

8536-IISSTA(Pr)-M-18

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STATISTICS

Paper STCP 2.2 – PRATICALS BASED ON STCT 2.2

Time : Two hours Maximum : 30 marks

Answer any **THREE** questions.

Each question carries **10** marks.

1. (a) Show that $N(0, \theta^2)$ distribution belongs to one parameter exponential family of distributions. Hence find its mean, variance and moment generating function for $\theta = 2$.

   (b) Obtain Fisher information about θ contained in 25 observations of Logistic $(\theta, 1)$. Also find Fisher information for $\sqrt{\theta}$ for given $\theta = 12$. (5 + 5)

2. A random sample of size 15 is taken from $P(\lambda)$ as follows :

   8, 64, 21, 6, 16, 42, 21, 02, 13, 62, 14, 19, 24, 32, 47

   (a) Obtain sufficient statistic for λ

   (b) Obtain any three unbiased estimates of λ

   (c) Obtain unbiased estimate of λ^2. (2 + 6 + 2)

3. (a) Following is the sample from $N(\mu, \sigma^2)$:

   –4.8, –1.8, 4.5, 1.6, 6.2, –2.7, 2.65, –1.2, 3.6, 1.9. Obtain UMVUE of $P(X > 6.8)$ given $\sigma = 5.2$.

   (b) Let $X \sim p_\theta(x) = e^{-(x-\theta)}$, $x > \theta$, obtain CRKLB to variance of an unbiased estimator. Comment on your results. (5 + 5)

4. (a) Suppose pdf of a rv is given by $p_\theta(x) = \theta x^{\theta-1}$, $0 < x < 1$, and the random sample is 0.2, 0.6, 0.9, 0.5, 0.4, 0.3, 0.8, 0.1, 0.7, 0.8. Obtain any three moment estimate of θ.

   (b) Use the method of Scoring to estimate the parameter in a multinomial experiment with cell frequencies 125, 18, 20, 34 and cell probabilities, $\frac{3-2\theta+\theta^2}{4}$, $\frac{2\theta-\theta^2}{4}$, $\frac{2\theta-\theta^2}{4}$ and $\frac{1-2\theta+\theta^2}{4}$. (3 + 7)

8537-IISSTA(Pr)-M-18

M.A./M.Sc. DEGREE EXAMINATION MAY 2018.

Second Semester

(CBCS)

STATISTICS

Paper STCP 2.3 – PRACTICALS (BASED ON STCT 2.3)

Time : Two hours Maximum : 30 marks

Answer any **THREE** of the following questions.

Each question carries **10** marks.

1. (a) Compute CDR and ASDR for following data : England and Wales (1995).

Age Group	Mid – Year Population ('000)		Number of Deaths ('000)	
	Males	Females	Males	Females
1 – 14	1403	1335	0.40	0.34
5 – 14	3394	3219	0.61	0.42
15 – 24	3348	3172	2.45	0.91
25 – 34	4252	4076	4.10	1.84
35 – 44	3523	3480	5.86	3.64
45 – 54	5630	5900	44.20	27.79
55 – 64	2078	2477	74.50	52.70
65 – 74	1032	1702	91.60	96.40
75 & above	240	708	46.60	107.50

(b) Compute standardized death rate for the following data by using indirect method.

Age Group	Total Population	Kerala ASDR ('000)	Number of Deaths	India ASDR ('000)
0-4	2759472	4.1142	11353	28.5085
5-9	2851210	0.1837	1379	2.9046
10-14	3053991	0.3346	1022	1.6137
15-19	3106710	0.7577	2354	2.2592
20-24	3045578	1.0829	3298	3.0122
25-29	2653761	1.2217	3242	3.3350
30-34	2208682	2.2851	5047	3.3350

Age Group	Total Population	Kerala ASDR ('000)	Number of Deaths	India ASDR ('000)
35-39	1931589	3.2989	6372	4.1956
40-44	1579321	2.2522	3557	5.1638
45-49	1284361	4.5789	5881	7.9609
50-54	1095689	6.9052	7566	12.1565
55-59	967916	9.7137	9402	18.9340
60-64	873476	17.2415	15060	30.6601
65-69	685816	25.1525	17250	44.7530
70 +	1000966	82.7601	82840	49.2349

CDR for Kerala = 6.03 CDR for India = 9.8 (4 + 6)

2. (a) Compute CBR, GFR, ASFR and TFR for the following data. Assuming that sex ratio at birth is 1.05, compute GRR.

Age Group	Female Population	No. of Births
15-19	1593505	46474
20-24	1602390	239237
25-29	1390614	175342
30-34	1127005	53027
35-39	967062	14554
40-44	783424	3408
45-49	644214	461

(b) Obtain (i) GRR, (ii) NRR, (iii) Intrinsic growth rate (r) and (iv) Mean length of a generation (g) for the following data : (5 + 5)

Age	ASFR (f_x)	$L_{x/2.5}(l_0 = 10{,}000)$
15-19	0.033	0.9903
20-24	0.090	0.9890
25-29	0.120	0.9871
30-34	0.087	0.9850
35-39	0.032	0.9817
40-44	0.006	0.9766
45-49	0.000	0.9685

3. Construct a abridged life table by using Greville's method. (10)

Age-Group	${}_nm_x$
0-1	0.0167
1-5	0.0011
5-10	0.0005
10-15	0.0003
15-20	0.0008
20-25	0.0011
25-30	0.0012
30-35	0.0023
35-40	0.0033
40-45	0.0023
45-50	0.0046
50-55	0.0069
55-60	0.0097
60-65	0.00172
65-70	0.0252
70+	0.0828

4. (a) Male Population of Rajasthan (1991) by single years of age is as follows :

Age	Population	Age	Population	Age	Population	Age	Population
0	657150	25	911791	50	715191	75	69160
1	359770	26	228157	51	21690	76	4930
2	713060	27	178820	52	88293	77	3130
3	656125	28	390021	53	27840	78	6910
4	690270	29	60806	54	23120	79	1310
5	768000	30	1021057	55	372750	80	75280
6	778375	31	52170	56	34991	81	1544
7	553887	32	300173	57	24308	82	4361
8	902590	33	95720	58	55917	83	1607
9	379001	34	68738	59	10360	84	1391
10	945208	35	929163	60	539121	85	17833

Age	Population	Age	Population	Age	Population	Age	Population
11	341309	36	118706	61	10573	86	1433
12	772934	37	69686	62	46410	87	1004
13	442807	38	179239	63	13360	88	1215
14	461023	39	32820	64	14430	89	427
15	643134	40	874197	65	243297	90	113973
16	485540	41	27281	66	13170	91	358
17	258445	42	142332	67	10003	92	830
18	684996	43	45770	68	21187	93	226
19	172469	44	33372	69	3860	94	183
20	811704	45	641760	70	244584	95	2248
21	171756	46	51443	71	4210	96	233
22	489587	47	51945	72	17545	97	184
23	199721	48	111492	73	5310	98	441
24	198598	49	18001	74	4530	99	390

Compute Myer's Index.

(b) Population of India for the following year is given. Estimate the population of 2011 using :

(i) Linear Model

(ii) Geometric Model and

(iii) Exponential Model

Compare them with actual population. (6 + 4)

Year	Population
1941	318,660,580
1951	361,008,090
1961	43,9234,771
1971	548,159,652
1981	685,565,086
1991	844,393,192
2001	1040,234,540