Second Year Higher Secondary Examination, March 2016

Subject: STATISTICS Code:1020

No	Scoring Indicators	Split Score	Total Score
1	$Y_1=\frac{-5}{x^6}$ or $-5x^{-6}$ (logarithmic functions not in syllabus)	2	2
2	Total cost= $\int MC\,dx$ $=\int(0.79-15x+1.2x^2)\,dx=0.79x-7.5x^2+0.4x^3+c$ Adding the fixed cost, Total cost= $0.79x-7.5x^2+0.4x^3$ +600 (Not compulsory)	1 1	2
3	Given $\int_0^a 3x^2dx=\int_a^1 3x^2dx$ $\left[x^3\right]_0^a=\left[x^3\right]_a^1$ $2a^3=1$ $a=\sqrt[3]{\frac{1}{2}}$ Or Application of any properties of a p.d.f give 3 score	1 1 1	3
4	Continuous or quantitative	1	1
5	E(XY)=E(X).E(Y) Or Any other suitable answer give one score (expectation of bivariate case is not in the syllabus)	1	1
6(a)	Trials are finite Two outcomes only P(success) remains constant Trials are independent Or Illustration of binomial situation with an example shall also be considered.	½ ½ ½ ½	2
6(b)	p= $\frac{1}{200}$ =0.005 λ =np=10X0.005=0.05 P(3 defective)=P(x=3)= $\frac{e^{-0.05}\times(0.05)^3}{3!}$ Or P(X=3)= $10C_3(0.005)^3(0.995)^7$ Give 2 Score	½ ½ 1	2
7	μ =32.2, σ =0.3 P($\bar{x}$ >32)=P($\frac{\bar{x}-\mu}{\sigma/\sqrt{n}}>\frac{32-32.2}{0.3/\sqrt{4}}$) = P(Z > - 1.33) = 0.5+0.4082=0.9082 Or Attempting the problem as an application of normal distribution give 3 score	½ 1 ½ 1	3
8	F or F variable or F distribution.	1	1
9	$\mu=11500,\ \sigma=500$ P(X>12000)= $P(\frac{X-\mu}{\sigma}>\frac{12000-11500}{500})=P(Z>1)$ =0.5-0.3413=0.1587 $P(X=3)=5C_3(0.1587)^3(0.8413)^2$ Or Calculation probability using normal is sufficient. (4 Score)	1 1 1 1	4

Subject: Statistics — Code:1020

No	Scoring Indicators	Split Score	Total Score
	OR		
10	μ=450, σ=100 P(400< x <500)=P($\frac{400-450}{100} < \frac{x-\mu}{\sigma} < \frac{500-450}{100}$) = P(- 0.5< Z < 0.5) = 0.1915+0.1915=0.3830 Number of students earn between 400 and 500=500X 0.3830=191.5 ≈ 192	½ 1 1 1 ½	4
11	Symmetric	1	1
12(a)	<table><tr><td>NO</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>Samples</td><td>(6,8)</td><td>(6,10)</td><td>(6,13)</td><td>(6,15)</td><td>(8,10)</td><td>(8,13)</td><td>(8,15)</td><td>(10,13)</td><td>(10,15)</td><td>(13,15)</td></tr><tr><td>$\bar{x}$</td><td>7</td><td>8</td><td>9.5</td><td>10.5</td><td>9</td><td>10.5</td><td>11.5</td><td>11.5</td><td>12.5</td><td>14</td></tr></table> Mean of sample means=104/10=10.4 Population mean=52/4=10.4 Thus sample mean is an unbiased estimator of population mean	1 ½ ½ ½ ½	3
12(b)	(b) $\sum x_i^2$ Or Any other option (out of syllabus)	1	1
13	H_0: $\mu = 20$ H_1: $\mu < 20$ *or* $H_1 : \mu > 20$ *or* $H_1 : \mu \neq 20$ $\bar{x} = \frac{198.8}{10}$ =19.88, $\sigma = 0.4$ $Z = \frac{19.88-20}{0.4/\sqrt{10}}$ $= \frac{-0.12}{0.127} = -0.95$ Table value, $Z_\alpha = 2.33$ (depends on H_1) Here calculated value of Z < Table value of Z, so we accept Ho	½ 1 1 ½ ½ ½	4
	OR		
14	H_0: $\mu = 1700$ H_1: $\mu > 1700$ $\bar{x}$ = 1780, $\sigma = 65$ $Z = \frac{1780-1700}{65/\sqrt{400}}$ $= \frac{80}{3.25} = 24.62$ Table value, $Z_\alpha = 1.96$ Here calculated value of Z > Table value of Z, so we reject Ho	½ ½ ½ 1 ½ ½ ½	4
15	Z-test or t- test	1	1

Subject: Statistics Code:1020

<table>
<tr><th>No</th><th>Scoring Indicators</th><th>Split Score</th><th>Total Score</th></tr>
<tr><td>16(a)</td><td>Perfect positive or perfect or perfect linear or positive</td><td>1</td><td>1</td></tr>
<tr><td>16(b)</td><td>$\sum x = 35, \sum y = 49, \sum x^2 = 203, \sum y^2 = 371, \sum xy = 270$
COV(X,Y)=3.57
SD(X)=2
SD(Y)=2
Karl pearsons coefficient of correlation=0.89
Or
Using direct formula and correct answer give 3 score
Or
Any one answered correctly using spearmans rank correlation method, give score 3</td><td>1
½
½
½
½</td><td>3</td></tr>
<tr><td>17</td><td>We set up
H_0: sample means are equal
H_1: sample means are not equal
CF= $\frac{112^2}{15} = 836.27$
<table>
<tr><th>Source of Variation</th><th>df</th><th>SS</th><th>MS</th><th>F</th></tr>
<tr><td>Between Groups</td><td>2</td><td>5.73</td><td>2.87</td><td rowspan="2">F=1.22 (Here MSW>MSB)</td></tr>
<tr><td>Within Groups</td><td>12</td><td>42</td><td>3.5</td></tr>
<tr><td>Total</td><td>14</td><td>47.73</td><td></td><td></td></tr>
</table>
Table value of F= F(12,2,0.05)= 19.41
We reject H_0 since table value > calculated F
Or
Conclusion is not compulsory. If MSB and MSW are correct then give 4 score</td><td>½
½
2
½
½</td><td>4</td></tr>
<tr><td>18</td><td>F</td><td>1</td><td>1</td></tr>
<tr><td>19</td><td>$\bar{x} = 54.4, \bar{y} = 24.4$
$y - \bar{y} = byx(x - \bar{x})$
y-24.4= 0.37(x-54.4)
When x=35 then y=17.22</td><td>½
1
½
1</td><td>3</td></tr>
<tr><td>20</td><td>Square root of product of regression coefficients
Or
GM of regression coefficients
Or
function of regression coefficient</td><td>1</td><td>1</td></tr>
<tr><td>21</td><td>Perpendicular/ any suitable explanation</td><td>1</td><td>1</td></tr>
<tr><td>22</td><td>Short note on $\bar{x}$ chart or control limits for $\bar{x}$ or model of $\bar{x}$ chart
Short note on R chart or control limits for R or model of R chart</td><td>1
1</td><td>2</td></tr>
<tr><td>23</td><td>$\bar{p} = \frac{70}{15 \times 50} = 0.093$
CL $= n\bar{p}$ =50x0.093=4.65
UCL= $n\bar{p} + 3\sqrt{n\bar{p}\bar{q}}$ = 4.65+ 3x $\sqrt{4.22}$ =4.65+ 6.15=10.8
LCL = $n\bar{p} - 3\sqrt{n\bar{p}\bar{q}}$ = 4.65- 6.15=-1.5 Hence LCL=0
Conclusion with or without diagram</td><td>½
½
1
½
½</td><td>3</td></tr>
<tr><td>24</td><td>Percentages or ratios</td><td>1</td><td>1</td></tr>
</table>

Subject: Statistics Code:1020

No	Scoring Indicators	Split Score	Total Score
25			

p_0	p_1	q_0	q_1	p_1q_1	p_1q_o	p_0q_0	p_0q_1
8	10	10	8	80	100	80	64
10	13	8	6	78	104	80	60
11	15	15	12	180	225	165	132
14	12	7	5	60	84	98	70
12	8	5	4	32	40	60	48
				430	**553**	**483**	**374**

2

Fishers index number= $\sqrt{\frac{\sum p_1q_1}{\sum p_0q_1}\times 100 . \frac{\sum p_1q_0}{\sum p_0q_0}\times 100}$ 1

$= \sqrt{\frac{430}{374}\times 100 \times \frac{553}{483}\times 100} =$

$= \sqrt{1.1497\times 100 \times 1.1449\times 100} = \sqrt{1.3163} = 114.7$

1 4

26(a)	Y=20.6+16.8(x+5)	1	
	=16.8x+104.6	1	2

26(b)

year	Profit	Moving total	Moving average	centered moving average
2001	121			
2002	130			
		501	125.25	
2003	132			124.875
		498	124.5	
2004	118			123.25
		488	122	
2005	118			123
		496	124	
2006	120			125
		504	126	
2007	140			127.5
		516	129	
2008	126			
2009	130			

Moving total 1
Moving average 1 ½
Centered average ½ 3