



**Note: Answer all Questions**

**Part One:**

**A) Chose the right answer**

1) Let  $X$  and  $Y$  are jointly continuous with joint pdf

$$f(x, y) = cx^2 + \frac{xy}{3}, \quad 0 < x < 1, \quad 0 < y < 2$$

Then the value of  $c$  is

- A) 1                      B)  $\frac{1}{3}$                       C) 3                      D) -1

2) The distribution that has the same mean and variance is

- A) Exponential distribution                      B) Poisson distribution  
C) Chi-Square distribution                      D) Uniform distribution

3) Suppose the j.p.d.f

$$f(x, y) = \frac{3}{2}x^2 + y \quad 0 < x < 1, \quad 0 < y < 1$$

Then the value of  $\Pr\left(0 < x < \frac{1}{4}, \quad 0 < y < \frac{1}{2}\right)$  is

- A) 32                      B)  $\frac{2}{3}$                       C)  $\frac{3}{2}$                       D)  $\frac{1}{32}$

**B) (True & False)**

1) If  $X$  and  $Y$  are independent, then  $cov(x, y) = E(XY) - E(X)E(Y)$

2) The two r.v's  $X$  and  $Y$  are independent on the j.p.d.f.

$$f(x, y) = x + y \quad 0 < x, y < 1$$

3)  $E(x^2) = E(E(x^2|y))$

  
أ.م.د. مشتاق كريم عبدالرحيم

**Part Two:**

- 1) Find the marginal p.m.f  $f(x)$  for the j.p.m.f

$$f(x, y) = \frac{xy^2}{3^0} \quad x = 1, 2, 3, \dots, y = 1, 2$$

- 2) Prove that

A)  $E(x^2) \geq [E(x)]^2$

B) If any two r. v's  $X$  and  $Y$  are independent the  $cov(x, y) = 0$

- 3) Write any three continuous distribution with p.d.f, c.d.f, mean, and variance

**Example:**

No.	Name	p.d.f	c.d.f	mean	Variance
1	Bernoulli	$p^x q^{1-x}$	$\begin{cases} 0 & , x < 0 \\ 1 - p & , 0 < x < 1 \\ 1 & , x \geq 1 \end{cases}$	$p$	$pq$

- 4) Let  $Y_1 < Y_2 < Y_3$  be an order statistic of size 3 from distribution has p.d.f

$$f(x) = 2x \quad , 0 < x < 1$$

Find  $g(y_1)$  and  $g(y_3)$



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Q		First: Article Questions: (40% )Marks														
1-	<p>If the time series follows the following pattern</p> $x_t = \phi_1 x_{t-1} + \phi_2 x_{t-2} + \dots + \phi_p x_{t-p} + e_t - \theta_1 e_{t-1} - \theta_2 e_{t-2} \dots - \theta_q e_{t-q}$ <p>Choose two of the following models [ ARMA(2,3), ARMA(0,4) , ARMA(3,0) ]</p>															
2	<p>If you know that <math>n = 10</math>, <math>r_1 = -0.09</math>, <math>r_2 = 0.20</math>, <math>r_3 = 0.181</math>, test the null hypothesis as <math>H_0: r_1 = r_2 = r_3</math>, using the (Box Pier) method, with a degree of freedom 17. Note that <math>(\chi^2) = 27.58</math> the tabular value</p>															
3	second: MCQ Questions : ( 40% )Marks															
No.	Question	A	B	C	D	True Answer										
1.	<p>If you have the following schedule the (MAPE) value is</p> <table border="1" style="margin-left: 20px;"> <tr> <td><math>x_t</math></td> <td>11</td> <td>23</td> <td>16</td> <td>38</td> </tr> <tr> <td><math>e_t</math></td> <td>4-</td> <td>1.5-</td> <td>9-</td> <td>6.7</td> </tr> </table> <p>A- 29.19    B-34    c- 32    D- 17.6</p>	$x_t$	11	23	16	38	$e_t$	4-	1.5-	9-	6.7					
$x_t$	11	23	16	38												
$e_t$	4-	1.5-	9-	6.7												
2.	<p>When calculating the autocorrelation at the single displacement we get <math>\rho_1 = 0.20</math>, <math>\rho_2 = 0.19</math> then the value of <math>\phi_{11}</math> is equal to</p> <p>A- 0.43    B- 0.20 B- 0.22    D- 0.165</p>															
3.	<p>To exclude the effect of the general trend, we divide the four compounds</p> <p>A- the collective model B- the relative model C- the multiplicative model D- Mixed model..</p>															
4.	<p>From the general trend equation</p> $Y = a + b = 19 + 1.2t$ <p>Calculate the estimated sales value for the month (11)</p> <p>A- 12.5    B-32.2    C-22.9    D- 30.12</p>															



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5.	<p>If <math>x_i</math> represents the true value of the phenomenon <math>x</math> at period <math>(i)</math> and <math>F_i</math> is the predictive value of period <math>(i)</math> then we can know this scale is</p> <p>A- correlation B- the error C- deviation D- Mean</p>																					
6.	<p>The following data represent the amount of sales for a period of three years according to the seasons. Seasonal evidence was obtained using the averages method</p> <table border="1" data-bbox="363 1108 941 1310"> <thead> <tr> <th>المسنة</th> <th>فصل 1</th> <th>فصل 2</th> <th>فصل 3</th> <th>فصل 4</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>24</td> <td>38</td> <td>45</td> <td>75</td> </tr> <tr> <td>2</td> <td>23</td> <td>30</td> <td>42</td> <td>72</td> </tr> <tr> <td>3</td> <td>22</td> <td>31</td> <td>43</td> <td>78</td> </tr> </tbody> </table> <p>A- Seasonal evidence 53.8 69.4 101.28 175.43 B- Seasonal evidence 50.8 67.4 101.28 170.11 C- Seasonal evidence 55.8 69.4 107.2 175.43 D- Seasonal evidence 55.8 69.4 107.28 176.42</p>	المسنة	فصل 1	فصل 2	فصل 3	فصل 4	1	24	38	45	75	2	23	30	42	72	3	22	31	43	78	
المسنة	فصل 1	فصل 2	فصل 3	فصل 4																		
1	24	38	45	75																		
2	23	30	42	72																		
3	22	31	43	78																		
7.	<p>From the table the general trend equation was extracted Using a mid-chain method.</p> <table border="1" data-bbox="487 1814 902 1923"> <tbody> <tr> <td><math>y_t</math></td> <td>8</td> <td>7</td> <td>5</td> <td>9</td> <td>2</td> </tr> <tr> <td><math>t</math></td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> </tr> </tbody> </table>	$y_t$	8	7	5	9	2	$t$	1	2	3	4	5									
$y_t$	8	7	5	9	2																	
$t$	1	2	3	4	5																	



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	$A - Y_t = 7.5 - 0.8t$ $B - Y_t = 4.5 + 0.8t$ $c - Y_t = 5.5 + 0.8t$ $D - Y_t = 7.5 + 0.8t$				
8.	If you have four MSE models, the best model is A- 19.5 , B- 32.7 C- 10.2    D- 44.3				
9.	You have the occasional and periodic data $x_t = 10, 25, 33, 14, 63$ and the periodic effect was obtained for a length of (3) period A= --- 40 55 65 B= --- 46 62 68 C= --- 43 52 69 D= --- 33 50 67				
10	If you have values of $e_i: 11.3, 10.9, 220, 14.5, 36.8$ then the (MSE) value is A - 90541.6 B - 10032.2 C - 10042.2 D - 80435.1				

Thrid : True And False : ( 20% ) Marks

No	Question	T	F	True Answer
1	If you have 11 sales values for a specific company were calculated $(\bar{Y}_1 = 13.6)$ and $(24.8 = \bar{Y}_2)$ , then the general trend equation is ( $yt = 2.036 + 11.6t$ )			



2	<p>If you have the following table, excluding the general trend effect according to the mathematical model is --- 105.88 103.08 ---</p> <table border="1"><tr><td><math>Y_t</math></td><td>100</td><td>144</td><td>167</td><td>175</td></tr><tr><td><math>\bar{Y}_t</math> وسط متحرك</td><td>---</td><td>136</td><td>162</td><td></td></tr></table>	$Y_t$	100	144	167	175	$\bar{Y}_t$ وسط متحرك	---	136	162				
$Y_t$	100	144	167	175										
$\bar{Y}_t$ وسط متحرك	---	136	162											
3	<p>If you know that the value of <math>a = 17.4</math> and the value of <math>b = 120.8</math>, then an estimate of sales for the third month using the general trend equation using the least squares method is 370.8</p>													
4	<p>The forecast range is divided into three parts: A - short range , B - medium range , C - long range</p>													
5	<p>If we have a time series of observations, then the additive model of the series consists of the product of the four components</p>													

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امتحان التنافسي للعام 2020-2021

**PART I (MCQ):** select the most appropriate answer for the following questions)

1- Consider this fictitious data that you might see in some linear regression output.

What is the value of  $a$  (intercept)?

Model		Unstandardised coefficients		Standardised coefficients	t	Sig.
		b	Std. error	Beta		
1	Constant	8.425	.725		11.620	.000
	Sport ability	-.633	.109	-.900	-5.832	.000

- a) -.900
- b) -.633
- c) -5.832
- d) 8.425

2- In addition to this data we have some confidence intervals. What can we say about the 95% confidence interval for the intercept?

	Unstandardised coefficients		Standardised coefficients	t	Sig.	95% confidence interval for B	
	b	Std. error	Beta			Lower bound	Upper bound
Constant	8.425	.725		11.620	.000	6.753	10.097
Sport ability	-.633	.109	-.900	-5.832	.000	-.883	-.383

- a) This means that on this sample the intercept of the population is 5% likely to lie in the range 6.753 to 10.097.
- b) The 95% confidence interval for the intercept is -.883 to -.383.
- c) We can be 95% confident that the intercept of our population can be found within the interval 6.753 to 10.097.
- d) This means that on this sample the intercept of the population is 5% likely to lie in the range -.383 to -.883.



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3- In the data above in Q3 the  $t$  value for sport ability was 5.83 and the associated probability is 0.000. Which of the following is most appropriate?

- a)  $p < 0.05$
- b)  $p < 0.001$
- c)  $p < 0.0001$
- d)  $p < 0.01$

4- Linear regression means that every time the value of  $x$  increases,  $y$  changes by a *constant* amount.

- a) True
- b) False

5- With the following data we can say that we have (in our sample) accounted for 50% of the variance in coping by our explanatory variables (problem solving and motivation). True or false

Model	R	R square	Adjusted R square	Std. error of the estimate
1	.714	.519	.501	.68

- a) True
- b) False

6- Linear regression means that every time the value of  $x$  increases,  $y$  changes by a *constant* amount.

- a) True
- b) False

7- Which of the following techniques is used to predict the value of one variable on the basis of other variables?

- a. Correlation analysis
- b. Coefficient of correlation
- c. Covariance
- d. Regression analysis

8- The residual is defined as the difference between:

- a. the actual value of  $y$  and the estimated value of  $y$
- b. the actual value of  $x$  and the estimated value of  $x$
- c. the actual value of  $y$  and the estimated value of  $x$
- d. the actual value of  $x$  and the estimated value of  $y$





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9-If the standard error of estimate  $s_e = 20$  and  $n = 10$ , then the sum of squares for error, SSE, is:

- a. 400
- b. 3,200
- c. 4,000
- d. 40,000

10-In simple linear regression, which of the following statements indicates there is no linear relationship between the variables  $x$  and  $y$ ?

- a. Coefficient of determination is 1.0.
- b. Coefficient of correlation is 0.0.
- c. Sum of squares for error is 0.0.
- d. None of these choices

11. A multiple regression model has the form:  $\hat{y} = 5.25 + 2x_1 + 6x_2$ . As  $x_2$  increases by one unit, holding  $x_1$  constant, then the value of  $y$  will increase by:

- a. 2 units
- b. 7.25 units
- c. 6 units on average
- d. None of these choices

12- In a multiple regression model, the value of the coefficient of determination has to fall between

- a. -1 and +1.
- b. 0 and +1.
- c. -1 and 0.
- d. None of these choices

**PART II**

let  $Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \beta_3 x_{i3} + u$  and

$$\hat{y}_i = 9.279 + 0.362 X_1 + 2.103 X_2 + 0.211 X_3$$

$$n=10, \sum_{i=1}^{10} y_i = 130, \sum_{i=1}^{10} x_1 y_i = 69, \sum_{i=1}^{10} x_2 y_i = 228$$

$$\sum_{i=1}^{10} x_3 y_i = 286, \sum_{i=1}^{10} y_i^2 = 1880$$

1-Write the ANOVA table and test the significance of regression if

$$F(3,6,0.95) = 4.76$$

2-  $S^2_e$

3-  $R^2$

اسئلة امتحان تنافسي مادة الاستدلال (ماجستير احصاء)

Q1\ (MCQ) : (From 30 )Marks	A	B	C	D
<p>1- When is the estimator efficient</p> <p>A- Low variance      B- High variance</p> <p>B- High mean          D- Low mean</p>				
<p>2- When is the estimator consistent</p> <p>A- is bias and variance approaches zero with increasing sample size.</p> <p>B- is unbiased and variance approaches zero with decreasing sample size.</p> <p>C- is bias and mean approaches zero with increasing sample size..</p> <p>D- A- is unbiased and mean approaches zero with increasing sample size..</p>				
<p>3- Why is the sample mean a better estimate of the population mean?</p> <p>A- unbiased and consistent with least possible variance</p> <p>B- biased and consistent with least possible variance</p> <p>C- unbiased and consistent</p> <p>D- consistent with least possible variance</p>				
<p>4- What is the estimator trying to measure?</p> <p>A-population parameter measures</p> <p>B-Sample parameter measures</p> <p>C- parameter measures</p> <p>D -mean parameter measures</p>				
<p>5- To estimate the mean population <math>\bar{X} + \frac{1}{n}</math>. Is this estimator unbiased? Is it consistent?</p> <p>A-biased , consistent ,    B-unbiased , consistent</p> <p>C-biased , inconsistent , D-unbiased , inconsistent</p>				
<p>6- The moment Generating Function for uniform</p> <p>A- <math>m_x(S) = \frac{e^{bs} - e^{as}}{(b+a)s}</math>      B- <math>m_x(S) = \frac{e^{bs} + e^{as}}{(b+a)s}</math></p> <p>C- <math>m_x(S) = \frac{e^{bs} + e^{as}}{(b-a)s}</math>      D- <math>m_x(S) = \frac{e^{bs} - e^{as}}{(b-a)s}</math></p>				
<p>7- t- distribution</p> <p>A- <math>t = \frac{\text{unNormal distribution}}{x^2 \text{ distribution}}</math></p> <p>B- <math>t = \frac{\text{Normal distribution}}{F \text{ distribution}}</math></p> <p>C- <math>t = \frac{x^2 \text{ distribution}}{\text{Normal distribution}}</math></p> <p>D- <math>t = \frac{\text{Normal distribution}}{x^2 \text{ distribution}}</math></p>				

8- F- distribution

$$A - F = \frac{T \text{ distribution}}{x_m^2 \text{ distribution}}$$

$$B - F = \frac{\text{Normal distribution}}{x_m^2 \text{ distribution}}$$

$$C - F = \frac{x_n^2 \text{ distribution}}{x_n^2 \text{ distribution}}$$

$$D - F = \frac{x_n^2 \text{ distribution}}{x_m^2 \text{ distribution}}$$

9- What are the values for random Hypergeometric distribution

A- 1,2,3,4,.....,n ,

B- 1,2,.....n-1

C- 1,2,3,.....,n ,

D- 0,1,2,.....,n

10- Mean Square Error ( MSE) used

A- A comprehensive standard for measuring the accuracy of not results

B- Standard Normal

C- convariance

D- A comprehensive standard for measuring the accuracy of results

Q2\ You have the following information . Find

1- Write the appropriate hypothesis for each case.

2- Finding the test statistic value. ( From 20 Marks )

	$\bar{X}_1$	$\bar{X}_2$	$n_1$	$n_2$	$\mu_1$	$\mu_2$	$S_1^2$	$S_2^2$	$\sigma_1^2$	$\sigma_2^2$
1	20		36		19				16	
2	32	30	28	27			16	9		
3			10				30		36	
4			24	25			20	40.2		

Q3\ What is the property of the estimator maximum likelihood function? Find the estimator of the poisson distribution ( $\lambda$ ). (20 Mark)

No.	Q4\ True And False : (From 30 )Marks	T	F
	Multivariate random ,It is a random variable that consists of more that one number		
2	(0,1) Is the property that defines a Bernoulli random		

	variable.		
3	The only number that fully identifies Bernoulli's random variable is equal to one (called probability P)		
4	You should be probabilities non-negative, The sum of them is equal to the integer one		
5	Probabilities must be non-negative, and their sum is equal to one.		
6	When the unbiased value is zero then MSE equal variance		
7	The moment Generating Function $m_x(S) = E(e^{sx}) = 1 - SE(x) + \frac{S^2}{2!} + E(x^2) + \frac{S^3}{3!} + E(x^3) + \dots$		
8	The moment Generating Function for uniform $m_x(S) = \frac{e^{bs} + e^{as}}{(b+a)s}$		
9	Bata Distribution for type II $f(x) = \frac{1}{B(\alpha, \beta)} \frac{X^{\alpha-1}}{(1+X)^{\alpha+\beta}} \quad 0 \leq x \leq \infty, \alpha, \beta > 0$		
10	Mean Square Error (MSE) is $MSE = E[T + \phi(x)]^2$		

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استاذة المادة

أ.د شروق عبد الرضا السباح

رئيس قسم الاحصاء

# الدرجات اعطيت اعجاب

اسئلة الاحتمالات

اولا: (40 درجة)

1. جد ناتج  $\sum_{x=0}^m C_x^m$
2. ما هي خصائص الاحتمال؟
3. لدينا  $p(A)=0.5$  ,  $p(B)=0.7$  برهن ان  $0.2 \leq p(AB) \leq 0.5$
4. ما هو ناتج  $y = 0.8 + 0.8 * 0.2 + 0.8 * 0.2^2 + 0.8 * 0.2^3 + \dots$
5. اذا علمت ان  $f(x) = \frac{k}{5}$   $2 < x < 10$  هي دالة احتمالية ، جد قيمة K.
6. عينة فيها 4 رجال و6 نساء، ما هو احتمال ان نسحب 2 من العينة بدون ارجاع ويكونا رجلين.
7. ما هو عدد ترتيب الأرقام من 3 الى 7؟
8. برهن ان  $e^a = \sum_{x=0}^{\infty} \frac{a^x}{x!}$
9. جد ناتج 4!
10. جد القيمة المتوقعة لـ X اذا علمت ان  $1 < x < 6$  ,  $f(x) = 0.2$

المجموعة الثانية: (60 درجة)

اجب بصح او خطأ

1.  $P(AB) \geq p(A)$
2.  $P(A \cup B) > P(A) + P(B)$
3. Two events A and B are said to be independent if  $p(A) \neq p(B)$
4. Two events A and B are said to disjoint if  $p(AB) = p(A) \cdot p(B)$
5.  $p(\cup_{i=1}^n A_i) = \sum_{i=1}^n p(A_i)$  if  $A_1, A_2, \dots$  are independent
6. If  $3 < x < 6$  then  $E(x)$  is either  $< 3$  or  $> 6$
7. If A and B are independent then  $p(A \setminus B) = p(A)$
8. The p.d.f  $f(x)=1$  is the normal p.d.f.
9. The probability mass function is defined on continuous variable
10. Their does not exist a negative variable in the probability density function

Good luck to you

أسئلة التصميم / الماجستير

أولاً: ( 40 درجة)

1. ما هو التصميم؟
2. عرف  $\alpha$
3. متى يستعمل الباحث التصميم؟
4. لماذا نلجأ الى تصميم القطاعات الكاملة العشوائية؟ الا يكفينا التصميم الكامل العشوائية؟
5. لماذا نلجأ الى تكرار التجربة؟
6. ما هي فرضية العدم؟
7. متى ترفض فرضية العدم؟
8. من يقرر رفض فرضية العدم؟
9. ما هو الخطأ التجريبي؟
10. ما هو الخطأ النقي؟

ثانياً: (60 درجة)

اختر الإجابة الصحيحة

1. يمتاز الخطأ التجريبي بدرجة حرية اكبر في التصميم ( أ - التام التعشيرية ب - القطاعات الكاملة العشوائية)
2. يعتمد الباحث على ( أ - قيمة  $\alpha$  ب - قيمة  $\beta$ ) لرفض فرضية العدم.
3. يلجأ الباحث الى أسلوب بديل لرفض فرضية العدم هو ( استشارة ذوي الاختصاص ب - الاعتماد على قيمة F الجدولية )
4. يلجأ الباحث الى اختبار ( أ - بارنتل ب - اقل فرق معنوي Lsd ) لاختبار تجانس البيانات
5. يُعد اختبار دنكان افضل من اختبار Lsd اذا ( أ - ازداد عدد البيانات ب - ازداد عدد المتوسطات)
6. يلجأ الباحث الى اختبار الفروق اذا رفضت ( أ - فرضية العدم ب - الفرضية البديلة)
7. تتأثر درجة حرية المعالجات ب ( أ - عدد المعالجات ب - تكرار المعالجات)
8. من مشاكل التجارب العاملة ( أ - قلة البيانات ب - ارتفاع كلفتها)
9. يشترط في الاختبار ان تكون المؤشرات ( المقدرات ) الإحصائية ( أ - مستقلة ب - معتمدة)
10. ليس للخطأ التجريبي درجة حرية اذا لم تكرر ( أ - التجربة ب - المعالجات)

ارجو لكم التوفيق