CONTENTS

MATHEMATICS (T) (954/1)

OVERALL PERFORMANCE

In Semester 1, 4694 candidates sat for the examination of this subject and 54.97% obtained a full pass.

The percentage of each grade is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	7.86	5.09	7.95	6.92	9.29	6.97	10.89	5.73	6.65	5.77	26.89

CANDIDATES' RESPONSES

General comments

In general, most of the candidates attempted to answer all the questions and the answers given were shown clearly with the required necessary workings. The majority of the candidates worked sequentially through the paper. Correct solutions to all questions were seen too. Generally, answers given in Questions 1(*a*), 6(*a*) and 8(*a*) were excellent while performance in Question 3 was just good. Answers in Questions 2, 5, 6(*b*) and 7 were poorly performed by the candidates. Some candidates did not show sufficient steps or made clear reason that led to the answers. This occurred most frequently when they were working towards the answers, for example, in Questions 1(*b*) and 3. Candidates were penalised for the omission of essential working in such cases. Overall, candidates still continue to experience challenges with algebraic manipulation, reasoning skills and analytic approaches to solve the problem.

Good candidates gave well-organised answers with systematic and strategised steps presented, showing their full understanding of the questions and concepts. Their performance in Questions 1(*a*), 3, 4 and 6(*a*) were excellent with almost perfect scores in these questions. Likewise, these good candidates also displayed well-presented answers in Questions 1(*b*), 2, 5, 6(*b*), 7 and 8. Systematic steps were presented showing their full understanding of the questions and concepts.

As for the moderate candidates, they were able to present their answers well for the questions they were familiar with. Nevertheless, they made careless mistakes and had difficulty in answering more challenging questions such as Questions 2 and 5. Candidates who attempted Question 1, managed to get the two constants correctly and subsequently, they were able to factorise completely the given polynomial in their attempt to find the solution set for the given inequality. However, many candidates were not able to indicate that the prime quadratic factor was always positive and subsequently unable to work correctly to the answer and missed the last 3 marks. Most of these candidates were also able partially to answer Questions 3, 4, 6 and 8.

Weak candidates were unable to employ the basic concepts learned. They did not understand what were required in the questions and due to this reason, they could not apply the idea to solve the problems. Their workings were not well-planned. They wrote messy answers using wrong formula and mathematical principles, such as using wrong elementary row operations, having problems with cross product of two vectors and not able to determine the explicit formula of a sequence. As a whole, most of the weaker candidates were not able to organise, plan and coordinate their solutions systematically. In general, the performance of candidates of Semester 1, 2019 were better than last year. The use of language were good and clear. Almost all their scripts were answered in English. In Section B, most candidates generally answered only one question as instructed. Slightly better presentations and performances were seen in candidates who attempted Question 8. Some candidates still produced small and unorganized set of answers. Consequently, their scripts were totally packed and difficult for marking purposes. A few candidates still used two columns in presenting their working, split a page to two and squeezing two questions to one side making in a page with solutions of three to four questions which caused it hard for the examiners to write marks at the appropriate place.

Comments on individual questions

Question 1

Almost all candidates attempted this question and managed to obtain the first 4 marks. A few candidates failed in the attempt to find the 2nd linear factor of the polynomial. Almost 50% of the candidates lost the last 3 marks due to not indicating that $(x^2 + 2)$ was always positive. Some of the candidates ignored the statement of the positive sign but gave the correct answer and they lost 1 mark due to 'not well-presented working'. Good candidates were able to attain the two constants, either by using the calculator or "trial and error". They managed to get the linear and quadratic factors. Quite a number of the candidates realised the positive sign of the quadratic factors and successfully obtained the final answer. Overall, a number of candidates failed to answer the second part of Question 1 mainly due to the prime quadratic factor (PQF), where they did not indicate that the PQF $(x^2 + 2)$ was always positive for every x. Quite a number of candidates managed to achieve the final answer with the correct method shown for the two linear factors, $(x + 2)(2x - 1)$ without mentioning the reason of leaving out the PQF.

Answer: (*a*) $a = 2$ and $b = -4$; (*b*) $\{x \mid -2 < x < 0.5\}$

Question 2

Very few candidates scored full marks for this question. Only a few candidates knew the relation between a_n, S_n and S_{n-1}. Most candidates managed to get 1 or 2 marks only, and many candidates lost marks in part (*b*). Some candidates who attempted this question managed to gain at least the first two marks in part (*a*), using the $a_n = S_n - S_{n-1}$ relation. Only some candidates were able to express $a_{n+1} > a_n$ but they did not conclude that a_n increases. Most candidates successfully attained $a_{n+1} - a_n = 14$ but did not conclude that $a_{n+1} > a_n$. Nevertheless, those who were able to get the expression, $a_{n+1} - a_n = 14$ but unsuccessfully conclude, still managed to attain 1 mark. Most candidates did not mention the word 'constant' after obtaining $a_{n+1} - a_n = 14$, which then caused them to lose the last two marks in part (*b*). Quite a number of candidates used wrong relationship such as $a_n = S_{n+1} - S_n$. Some candidates used u_n instead of a_n. A substantial number of non-attempts candidates were seen in Question 2. Although most of the candidates were able to find the formula for a_n using $a_n = S_n - S_{n-1}$ but some did not get the final term. Some candidates attempted to find $a_{n+1} - a_n$ in the process of determining whether a_n increased when n increased, but end up losing mark since they did not mention that $a_{n+1} - a_n > 0$ or $a_{n+1} > a_n$. As for the question in part (*b*), almost all the candidates forgot about the word 'constant' before concluding that the series was an arithmetic series.

Answer: (*a*) $a_n = S_n - S_{n-1} = 14n - 16$

Question 3

Matrices was one of the favourite questions and the best performed question. Almost 75% of candidates magnificently use the Elementary Row Operations (ERO) to attain the row-echelon form. Most candidates successfully obtained the first 4 marks. Almost all candidates were able to answer the first part of this question perfectly. Quite a number of candidates did not know how to find the general form of the solution for the system to produce infinitely many solutions. Most of them, used $z = 0$ to get the answer for x and y. Some candidates still used improper ERO instruction(s) and improper form of matrix. Wrong concepts on operations of ERO were also seen. Part (*b*) did not offer good marks to the candidates since many of them did not get the right answer in finding the general form of the solution.

Answer: (*a*) $\left(\begin{array}{ccc|c} 2 & 3 & 0 & -6 \\ 0 & 7 & -3 & 13 \\ 0 & 0 & k-3 & 0 \end{array}\right)$;

(*b*) $k = 3$; $x = \dfrac{3t+6}{-2}$, $y = t$, $z = \dfrac{7t+13}{3}$ or $x = t$, $y = \dfrac{2t+6}{-3}$, $z = \dfrac{14t+3}{-9}$ or $x = \dfrac{9t+3}{-14}$
$y = \dfrac{3t-13}{7}$, $z = t$

Question 4

Good performance from the majority of the candidates. Many candidates achieved complete and perfect answers. Most of the candidates successfully attained the final answer to express a given complex numbers in the form of $a + b\text{i}$, except for those who did not use the polar form. Almost 90% of candidates were able to use the modulus and argument given to find the real and imaginary parts of the complex number. Such candidates applied the relation of the modulus and the argument given and they got the quadratic form of a or b. Nonetheless, some of these candidates did not realise the quadrant and chose a wrong value either for a or b. The choice of the value of a or b with a reason led the candidates to the correct answer. A few candidates did not use the polar form and instead tried to relate $z - 1$ with $a - 1$ and $b\text{i}$. After solving the relation, candidates got the quadratic relation either for a or b but they were not able to match the correct value with the correct reason. Candidates should check the quadrant for the given z.

Answer: $z = 3 - 2\text{i}$

Question 5

The performance of candidates in this question was moderate. Candidates did not take the opportunity of using the formula given in the question paper to answer this question. Many candidates used the wrong term, 'centre' instead of 'vertex' to show the coordinate of the focus for a parabola and ended up losing the last mark for the first part of the question. For example: $4(x - 1) = y^2$, centre $(1, 0)$ and $a = 1$, therefore focus was $(2, 0)$. Candidates were able to eliminate t and get the standard form for the equation of a parabola. Candidates were also able to obtain the two gradients and compared both of the gradients to get the value of t. Some candidates used the gradients and substituted in the line equation of PQ to get the coordinates of Q and deduced the value of t.

Answer: $t = -\dfrac{1}{2}$

Question 6

Most candidates performed well in this question. The majority of the candidates knew how to find the vectors $\overrightarrow{PQ}$ and $\overrightarrow{PR}$, and the cross product correctly. Candidates managed to evaluate $\overrightarrow{PQ} \times \overrightarrow{PR}$ and used the result to determine the area of triangle PQR. Some candidates were not able to relate coordinates of points given with its respective position vector and some candidates found magnitude of vector without considering the sign of its components. A few candidates were not able to find $\overrightarrow{PQ}$ and $\overrightarrow{PR}$ using addition of position vectors but instead worked on conceptually wrong concept such as: $\overrightarrow{PQ} = \begin{vmatrix} i & j & k \\ 1 & 3 & -2 \\ 2 & -1 & 1 \end{vmatrix} = i - 3j - 7k$; $\overrightarrow{PQ} = \begin{pmatrix} 1 \\ 3 \\ -2 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} = \begin{pmatrix} 3 \\ 2 \\ -1 \end{pmatrix}$ and $\overrightarrow{PQ} = \begin{pmatrix} 1 \\ 3 \\ -2 \end{pmatrix} \bullet \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix} = 2i - 3k - 2k$. Some candidates were confused with the area of the parallelogram with the area of triangle. The area of the triangle PQR was written as $\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right|$, without the $\frac{1}{2}$ in the formula. Some candidates found area of triangle by applying the wrong formula such as $\frac{1}{2}\overrightarrow{PQ} \times \overrightarrow{PR} \times \sin\theta$. There were candidates divided two cross product of vectors to determine the ratio. Some candidates redo the whole process of finding area for $\Delta PQ'R'$ by cross product, but then failed to get the answer due to careless calculations. A few candidates gave their answer but not in exact value but in decimal. Many candidates were not able to use the given information correctly into area of triangle to find its ratio i.e candidates were able to get $\overrightarrow{PQ'} \times \overrightarrow{PR'} = \left|2\overrightarrow{PQ} \times \overrightarrow{PR}\right|$ but not able to equate it with $4\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right|$ instead they stated wrongly as $2\left|\overrightarrow{PQ} \times \overrightarrow{PR}\right|$.

Answer: (*a*) $\overrightarrow{PQ} \times \overrightarrow{PR} = 7i + 7j + 7k$; Area $= \frac{7}{2}\sqrt{3}$ or $\frac{\sqrt{147}}{2}$; (*b*) 1 : 4

Question 7

Candidates who chose this question obtained less marks as compared with candidates who chose Question 8. Candidates were able to expand using binomial theorem and identify the coefficients of the terms. Then, they were able to solve the given quadratic equation to find the values of n. Candidates managed to substitute $x = \frac{1}{5}$ into the expansion equation, and successfully expressed the estimated value in the correct format. Many candidates found the two coefficient equations, but they were not able to combine and further reduced them into the required form. Some candidates were not clear with the question. For part (*a*), they found the value of $n = \frac{1}{3}$ and $n = -\frac{2}{3}$ using $9n^2 + 3n - 2 = 0$ and then resubstituted the values of n obtained into the expression $9n^2 + 3n - 2$ and equate it to 0. But, candidates wrongfully concluded that n satisfies the equation. The majority of candidates were not able to check the consistency of the values of n, p and q. Many of them just chose one set of these values silently without reason(s). A few candidates wrote the answer for part (*c*) not in the correct format either without '≈' sign or not in four decimal places. Candidates who attempted Question 7, mostly did not reach the final answer due to not checking the coefficient of x^4 and ended up with two values of p and q. One of the pairs actually did not fit the series expansion. The wrong choice of the values led to the wrong answer in part (*c*).

Answer: (*b*) $n = \frac{1}{3}$, $p = -\frac{3}{4}$, $q = -\frac{1}{16}$; (*c*) 0.9473 (4 dp)

Question 8

Candidates who attempted this question mostly succeeded to obtain good marks. Most candidates were able to calculate the angle in part (*a*). Some candidates were penalised in finding the exact angle between two planes. Candidates who used the cross product successfully demonstrate that the given vector, $2\mathbf{i} - \mathbf{j} - 5\mathbf{k}$ was parallel to both planes. Candidates solved simultaneous equation and reduced it to two variables before taking any point on the line. Most candidates knew the formula to get the equation of the plane. Candidates who used the dot product concluded that the given vector, $2\mathbf{i} - \mathbf{j} - 5\mathbf{k}$ was parallel to both planes without stating that the vector was actually perpendicular to the normal vector of the planes, thus parallel to both planes. Some candidates found the magnitude of the vector without considering the sign(s) of its component(s). Meanwhile, some candidates applied the wrong formula such as $|a \bullet b| = |a|\bullet|b| \cos\theta$. Many candidates were not able to find a point on the line. Some candidates tried to find the normal again and this cause the errors in calculation. Quite a number of candidates did not try to reduce simultaneously the two equations but they just pick any point which actually was not on the line. There were also candidates who neglected the negative values in the process of finding the magnitude of the vectors. For example, $(2\mathbf{i} - \mathbf{j} + \mathbf{k})(3\mathbf{i} - 4\mathbf{j} + 2\mathbf{k}) = \sqrt{2^2 + 1^2 + 1^2}\sqrt{3^2 + 4^2 + 2^2} \cos\theta$ without putting negative sign at 1^2 and 4^2. This kind of working was also penalised.

Answer: (*a*) $\theta = 24.53°$; (*c*) $\mathbf{r} = (3\mathbf{j} + 3\mathbf{k}) + \lambda(2\mathbf{i} - \mathbf{j} - 5\mathbf{k})$; (*d*) $2x - y - 5z = 1$

SEMESTER 1

MATHEMATICS (T) (954/2)

OVERALL PERFORMANCE

In Semester 2, 4669 candidates sat for the examination of this subject and 62.62% of them obtained a full pass.

The percentage of each grade is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	10.45	7.69	8.37	8.95	9.08	10.58	7.50	1.67	3.75	1.65	30.31

CANDIDATES' RESPONSES

General comments

In general, candidates were familiar and understood well the needs of the questions as reflected in their answers. Most answers to Question 1, Question 4 and Question 6 were well-done. But answers to Question 2, Question 3 and Question 5 were poorly performed, especially Question 3 which was related to part by part integration on logarithm function. It was also evident that some candidates had not done enough preparation and as a result performed very poorly. This was obviously seen in Question 3, Question 5 and Question 7. Overwhelming majority of the candidates preferred to answer Question 8 than Question 7 which was related to numerical iterations and evaluating area under a curve. Only a very small number of candidates chose to attempt Question 7 which related to find the extremum points and evaluating volume of a solid generated, but almost all of them performed poorly. There were candidates who still divided pages into two columns. This made it very difficult for examiners to indicate clearly where marks should be awarded. Many good and excellent scripts were seen and the standard of presentation was usually good. The paper seemed to give all candidates the opportunity to show what they had learned and understood on a number of questions. Many candidates were able to demonstrate their mathematical ability on this paper. This paper enabled the well-prepared candidates to perform well, demonstrated a good understanding of the syllabus content and applied the associated skills they had learned.

Comments on individual questions

Question 1

Most candidates were able to multiply the corresponding surd conjugate. A small number of candidates used the L'Hospital rule. The majority of the candidates used the correct concept of limit exist in their evaluation. Some candidates were not able to indicate the cancellation of the $(x - 4)$ factors correctly. Some candidates did not even cancel the factors before applying limit. Some candidates used the correct concept but due to wrong evaluation in part (a), the final answer leads to the wrong value of k.

Answer: (a) $\frac{1}{32}$; (b) $\frac{31}{128}$

Question 2

Candidates knew how to differentiate x and y with respect to θ, and they were able to apply the chain rule. Candidates knew that $m_t = \frac{dy}{dx}$ and the procedure to find equation of a line. Candidates were weak in differentiation which involved trigonometry and the application of trigonometric identity. Quite a number of candidates had mistakenly equating $\cot\theta$ to -1. Many candidates were also weak in solving trigonometric equation, especially in units of π radian.

Answer: $y = -x + 1 + \frac{\pi}{4}$

Question 3

Many candidates knew how to apply the process of integration by parts. They learned how to express fraction into proper and partial fractions. However, the majority of the candidates were unable to express into proper fraction and even the partial fractions.

Answer: $7 \ln 7 - 6$

Question 4

A majority of candidates were able to find the derivative of the given substitution with respect to x, before completing the task by substitution. The majority of the candidates were able to complete the task. Only careless algebraic operations lead to the wrong answer. Other than that, this question was well-answered.

Answer: $3(y - 2x)^2 + 2y - 6x + 2 = 0$

Question 5

Most candidates knew how to differentiate the basic exponential and inverse tangent functions, and also the application of composite or chain differentiation. Candidates who successfully obtained the first differential equation correctly, generally able to differentiate once further to obtain the given equation. Many candidates knew how to use the Maclaurin theorem to find the expansion and the procedure in limit evaluation. Problems arose when candidates differentiated $\tan^{-1} 2x$, where many candidates left out the '2' coefficient. Inability to get the first differential equation correctly led to wrong derivative values, which resulted in the wrong expansion obtained. Many candidates did not cancel the factors of x before applying the limits.

Answer: (*a*) $y = 1 + 2x + 2x^2 - \frac{4}{3}x^3 + \ldots$; (*b*) $\frac{1}{2}$

Question 6

The majority of the candidates were able to show the given equation correctly. Candidates were familiar with the iteration processes and the condition of stopping criteria. Some candidates were unable to show enough iteration computation processes. Almost all candidates did not know the condition of stopping criteria for oscillating case especially when they computed with three decimal places.

Answer: 5.57 (2 dp)

Question 7

Most candidates who attempted this question were able to find y' and y''. No candidate could sketch the correct graph. Almost all candidates were weak in solving trigonometric equation, which led to failing to evaluate the corresponding values of x correctly. Therefore, resulting in the wrong coordinates and nature of points found.

Answer: (*a*) Local minimum point = $\left(\frac{2\pi}{3}, \frac{2\pi}{3} - \frac{\sqrt{3}}{2}\right)$, local maximum point = $\left(\frac{\pi}{3}, \frac{\pi}{3} + \frac{\sqrt{3}}{2}\right)$;

(*b*) $\frac{3}{4}\pi^2$

Question 8

Candidates were familiar with the shape of these two curves. The majority of the candidates could apply the IVT very well. Candidates were familiar with the iteration processes and the condition of stopping criteria. Many candidates were not able to define the required area correctly and put incorrect limits in the integration equations. Many candidates forgot to label the important reference point(s) on the curve(s). Some candidates were not able to show enough iteration computation processes.

Answer: (*c*) 0.530 (3 dp) ; (*d*) 0.35338

MATHEMATICS (T) (954/3)

OVERALL PERFORMANCE

In Semester 3, 4651 candidates sat for the examination of this subject and 72.89% of them obtained a full pass.

The percentage of each grade is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	16.23	10.06	9.93	10.11	10.77	8.97	6.82	6.49	4.60	3.98	12.04

CANDIDATES' RESPONSES

General comments

Generally, candidates were good in answering quantitative questions, for example in Question 1, Question 3, Question 4(*b*), Question 6, Question 7 and Question 8. However, they were weak in answering questions related to probability, the underlying assumptions and conceptual questions such as Question 2, Question 3(*b*), Question 4(*a*) and Question 5. Some candidates answered the questions without understanding the concept and the correct way to present their answers including symbols and formulae. For example Question 4(*a*): Candidates were not able to determine the sampling distribution for the sample mean. In Question 5, candidates were not able to write the correct hypothesis statements. Meanwhile in Question 5 and Question 8, candidates were not able to differentiate between population and sample. They tested the hypothesis of sample statistic wrongly and constructed the confidence interval for population proportion using the wrong value of population proportion.

Good candidates showed competence over a wide range of topics. They were able to state their answers in systematic steps using the correct methods. The answers given were precise, neat and clearly stated. Some candidates used wrong notation in Question 4(*a*) and could not solve Question 8(*a*)(ii). In general, this group of candidates were able to present their answers and solution almost like the marking scheme.

Average candidates showed understanding and competence in answering some or parts of the questions. Poor planning caused them not to answer the question in Section B satisfactorily. Question 1, Question 2, Question 3 and Question 6 were well attempted but sometimes the working were not complete. A few candidates used three significant figures during intermediate steps for Question 6. Besides, the symbols p and $\hat{p}$ or $\overline{x}$ and μ were always non-differentiable by these average candidates.

Meanwhile, the weak candidates showed shallow understanding. Some did not attempt at all. Only parts of certain questions were attempted and their answers were either incomplete or incorrect. They were weak in many aspects, such as did not understand what was required by the questions did not know the concept and could not execute the formulae correctly. Therefore, their answers were not well-presented.

Comments on individual questions

Question 1

The majority of the candidates could answer the question well. Some candidates were not able to draw box-and-whisker plot correctly using the correct scale. Most candidates were not attentive with the key given in the question which was $4|5$ which means 4.5 and not 45 which led to losing all the accuracy marks. Some candidates drew the whiskers wrongly, where they drew up to lower fence and upper fence.

Answer: (*a*) 7.5, 1.6 ; (*b*) 4.0, 10.8

Question 2

Candidates could solve the given probability by using the tree diagram. Since there was only one outcome for all three successful targets hit in all the three shots, they could use the multiplication principle to determine the probability required. Candidates were expected to use the concept of conditional probability correctly to answer part (*b*) of the question. Candidates with good basic probability could answer part (*a*) correctly. Some candidates wrongly used the probability of success and failure to find the probabilities of "hits the target consecutively two times" and "hits the target consecutively two times $\cap$ exactly hit the target twice". Some candidates could not interpret the question correctly and interpret the probability of "hit the target in the following shot is half of the probability of the previous successful shot" as 0.5, which was wrong. The majority of candidates were poor in conditional probability. They assumed independent to find the conditional probability. Candidates did not state clearly the events that represent events A and B. Some candidates used binomial method to solve the question, for example ${}^3C_3(0.7)^3(0.3)^0$.

Answer: (*a*) 0.042875 ; (*b*) 0.48405

Question 3

Since it was a straight forward question, the majority of candidates could answer the question well especially for part (*a*). Candidates were able to find the value of p by equating $\mu = np$, before they solved the equations. Some candidates did not know how to substitute $\mu = np$ and $\sigma^2 = npq$ into the given expression. As in part (*b*), a few candidates did not know how to interpret $P(X > \mu)$, and some did not proceed to find the probability because they could not find the value of μ at the first place. Some candidates used normal distribution as an approximation to binomial distribution for part (*b*).

Answer: (*a*) 0.4 ; (*b*) 0.3669

Question 4

Good candidates could easily score full marks for this questions whereas moderate candidates could only answer part (*b*) correctly. Good candidates were able to recognize that this question was a sampling distribution and they used the correct symbol for sample mean. The weak candidates had no idea to answer the question and they did not really understand the meaning of "sampling distribution of sample mean". Hence, the candidates did not use the correct symbol for sample mean. The incorrect notation used by candidates were μ or X instead of $\overline{X}$. Besides, standard error was given in their working instead of Var $(\overline{X})$ in the normal distribution.

Answer: (*a*) $\overline{X} \sim N\left(63, \dfrac{6.9^2}{36}\right)$; (*b*) 0.04102

SEMESTER 3

Question 5

Most candidates could do the standardisation and gave the rejection area correctly. Hence, they could make correct decision to reject or do not reject H_0. Those who wrote hypothesis correctly could easily score full marks. Many candidates were not able to write hypothesis correctly which led to loss of many marks. Some candidates were not able to write correct alternative hypothesis statement. They wrote the hypothesis "μ is more than" ($\mu >$) or "μ is not equal to" ($\mu \neq$), instead of "μ is less than" ($\mu <$). A few candidates still gave hypothesis in sentences, which was not accepted. Some conclusion given by the candidates were not complete or not properly written. Some candidates' answers were not focused on the doctor's claim, which then were not accepted by the markers.

Answer: –

Question 6

Since this was a straight forward and popular question, good and moderate candidates could solve this question well. The majority of candidates obtained full marks. They stated the hypothesis correctly and were able to find the expected values (E_i) and carry out chi-squared goodness-of-fit test systematically. However, the weak candidates stated the hypothesis wrongly, and mixed up H_0 and H_1 in their hypothesis. Some of the candidates did not combine the adjacent classes when E_i was less than 5 which led to wrong degree of freedom. A few candidates used the wrong way in finding the degree of freedom. It should be (row – 1) × (column – 1) instead of (numbers of category – 1).

Answer: –

Question 7

This question was the least attempted question, maybe because it required skill in integration especially involving exponential function which most candidates try to avoid. Good candidates who attempted this question scored full marks since they were good in integration and they understood the question very well. Candidates who were weak in integration and chose this question did not attain very good marks. They were not able to carry out exponential integration of the function correctly. Hence, they could not answer part (*a*) of the question, which was to show that $\mu = \frac{1}{10}$. Even though the candidates could integrate correctly, some of them were not able to give the cumulative function in the correct form (write $t < 0$ instead of $t \leqslant 0$).

Answer: (*c*) 0.22313 ; (*d*)(i) 0.14404, (ii) 4.4626, 1.8616

Question 8

Most of the candidates attempted this question and some of them were able to obtain full marks. Good candidates could understand this question very well and they were able to write the hypothesis correctly, then scored very good marks. Some candidates did not know the meaning of unbiased estimate of population mean. So, they used wrong notation (they wrote μ instead of $\hat{\mu}$). Some candidates used the sentence 'the unbiased estimate of μ', which was accepted. Some average and weak candidates stated the hypothesis wrongly. Some candidates confused with the given proportion, whether it was a population proportion or sample proportion, therefore notation used by them was p instead of $\hat{p}$. Some candidates could not understand the question in part (*c*)(ii) about the terms "within 0.035". Since the candidates could not interpret that terms correctly, they were not able to solve inequality equation correctly.

Answer: $\hat{\mu} = 28.1$; (*c*)(i) (0.018882, 0.056118), $n = 114$

SEMESTER 3