LAPORAN PEPERIKSAAN
STPM 2022

Mathematics (M) (950)

MATHEMATICS (M) 950/1

OVERALL PERFORMANCE

The number of candidates for this subject was 738. The percentage of candidates who obtained a full pass was 31.04%.

The achievement of candidates according to grades is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	5.83	1.63	2.98	2.71	5.69	4.61	7.59	5.01	2.71	5.42	55.83

RESPONSES OF CANDIDATES

PAPER 950/1 (ESSAY)

General comments

Overall, the quality of answers is below average. Many candidates did not perform well. Only a few above average candidates' answers were systematic, logic, well organized and well presented with the right concepts and laws.

The candidates' use of English was standard.

Comments on individual questions

Question 1

Most of the candidates were not able to eliminate the log to obtain the equation $3x^2 - 22 = \left(\dfrac{4}{x}\right)^2$. Those who were able to obtain the quadratic equation failed to factorise and solve it. They failed to realise that $x > 0$ and gave both the positive and negative values of x.

Answer: $x = \sqrt{8}$

Question 2

For the first part, almost all candidates were able to determine the expression in the question. However, for the second part, most of the candidates were not able to determine that it was a telescoping series. Almost all candidates were not able to deduce the infinite sum. Some even applied the formula of the infinite sum of geometric series which was wrong.

Answer: $\displaystyle\sum_{r=1}^{n} \frac{2r+1}{r^2(r+1)^2} = 1 - \frac{1}{(n+1)^2},\ 1$

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Question 3

Most of the candidates were able to solve this question. There were some who used determinant even though the question specifically stated to use the elementary row operations. A group of very weak students used the wrong concepts of the elementary row. For example, multiplying row with row, dividing row with row, adding row with any scalar.

Answer: q = −7

Question 4

Most of the candidates were able to show that the point lies on the curve. However, they did not present their argument well enough, for instance $-4 = -4$. They were able to find the gradient by using the implicit differentiation. Some candidates wasted precious time to simplified / expressed $\dfrac{dy}{dx}$ in terms of x and y which was not necessary and some even ended up with the wrong expression at the end.

Answer: (b) $\dfrac{dy}{dx} = \dfrac{1}{2}$

Question 5

Most of the candidates were not able to answer part (*a*) because they were weak in solving integration by parts. The candidates mostly could get the correct partial fractions and integrate correctly in part (*b*).

Answer: (a) $\dfrac{1}{4}(e^2 + 5)$; *(b)* $\dfrac{1}{3}(2 \ln 4 - \ln 7)$ or $\dfrac{1}{3} \ln\left(\dfrac{16}{7}\right)$

Question 6

Most of the candidates were able to obtain the integrating factor and solve the equation by using the integrating factor. Some of them solved the problem using separable method. However, they were not able to find the limiting value of y.

Answer: (b) $y = 1 - \dfrac{e^2}{(x - 1)e^x}$; *(c)* 1

Question 7

Almost all candidates chose this question. However, many were not able to sketch the graph correctly. They were also not able to use mathematical argument to show that it is a one-to-one function and thus its inverse exists. They were not able to state the domain correctly and explained the existence of a composite function.

Answer: (c) $(g \circ f)(x) = 7 + \dfrac{2}{x}$, $-\infty < x < \infty$, $x \neq 0$; *(e)* $(g \circ f)^{-1}(x) = \dfrac{2}{2 - 7}$, $-\infty < x < \infty$, $x \neq 7$

Question 8

Almost none chose this question. For candidates who chose this question, they did it badly. One of the common mistakes was that they took $y = 200\ 000$ instead of $y = 0.2$. Candidates failed to find the second derivative. They were not able to show the point of inflexion even though the point is given. They were also not able to sketch the graph.

Answer: (a) $y = \dfrac{1}{1 + 4e^{-t}}$

MATHEMATICS (M) 950/2

OVERALL PERFORMANCE

The number of candidates for this subject was 731. The percentage of candidates who obtained a full pass was 59.92%.

The achievement of candidates according to grades is as follows:

Grade	A	A−	B+	B	B−	C+	C	C−	D+	D	F
Percentage	7.52	5.06	9.58	7.93	11.22	8.62	9.99	4.38	6.02	5.20	24.49

RESPONSES OF CANDIDATES

PAPER 950/2 (ESSAY)

General comments

In general, the performance of candidates was satisfying. The candidates were good in answering in quantitative questions but weak in answering qualitative questions. There was a significant difference in the quality of scripts produced by different centres. Some candidates had been well prepared and showed considerable confidence in their responses.

Comments on individual questions

Question 1

Most students answered this question well. Candidates could calculate median using correct formula but some candidates wrongly used lower boundary as 34.5 or 35.5 and size class as 6. A number of candidates were unable to interpret the answer obtained for part (*b*). There appeared to be some confusion between the Pearson's coefficient of skewness and the Pearson's correlation coefficient, and hence, gave a wrong interpretation.

Answers: (*a*) 37.5; (*b*) 0.0851, almost symmetrical.

Question 2

Overall performance for this question was moderate. Most candidates were able to answer part (*a*) of the question. For part (*b*), a number of candidates were unable to relate the question to conditional probability. For part (*c*), many candidates were unable to check the necessary criteria for independence using their answers from parts (*a*) and (*b*).

Answers: (*a*) $P(S) = 0.675$; (*b*) $P(S \setminus F) = 0.7$; (*c*) Not independent

Question 3

The performance of candidates was poor. Many students left the question without being attempted. Students were confused as to which distribution to use for part (*a*) with a number of them wrongly choosing Poisson distribution. In part (*b*), most candidates who attempted this question were able to identify the normal approximation but a number could not find the correct mean and variance for the approximation. This was due to the use of sample size of 100 or 56 instead of 140 to find mean and variance.

Answers: (*a*) 56; (*b*) 0.6822

Question 4

A majority of candidates answered this question well. They were able to interpret the scatter diagram and calculate the Pearson correlation coefficient. However, a number of candidates were unable to justify reasonably for part (*c*). Candidates were unable to justify why the new entrance test should be adopted in part (*c*) by relating to the high correlation observed in part (*b*).

Answers: (*b*) $r = 0.96$; (*c*) Yes

Question 5

Overall, the performance of the candidates was moderate. For the weighted average of price relatives, some of the candidates wrongly used the weighted aggregate formula instead. Most of the candidates could calculate simple aggregate index and comment on it but couldn't state the effect if price or quantity increase because they did not fully understand the concept.

Answers: (*a*) $s = $ RM2.10; (*b*) 172.31

Question 6

Generally, the candidates were able to plot the time series graph but some of the candidates' used odd scale which made the diagram difficult to plot and ended up with careless mistake. Almost all candidates failed to state components which are present and absent of the series. Since most of the candidates did not understand the use of moving average, they were unable to interpret and comment on the time series correctly.

Answers: (*a*) Present: irregular, Absent: trend, seasonal, cyclical
       (*c*) Not appropriate

Question 7

The performance of candidates was good. However, quite a number of the candidates were unable to plot the cumulative curve correctly where they used incorrect boundaries on *x*-axis and the scale is not uniform. Some candidates failed to estimate median, first quartile, third quartile and number of customers above 45 years old by using the graph. Some candidates wrongly calculated the percentile of customer above 45 years old as customer below 45 years old.

Answers: (*a*) Mean = 23.79, Variance = 78.75; (*c*) Median = 22, Interquartile range = 11; (*d*) 3.33%

Question 8

The performance of candidates was moderate. A majority of candidates were able to plot the scatter diagram but unable to interpret it correctly. Most of the candidate manage to find least square regression line in form of $y = a + bx$ correctly. However, quite a number of candidates were unable to calculate the coefficient of determination correctly. Most of them mix out coefficient of determination and Pearson Correlation coefficient especially when they interpreted the answer. Most candidates did not really understand the meaning of coefficient of determination. They failed to compare and explain why advertising expenditure is better predictor. Estimates in part (*e*) were wrongly calculated using the values of $x = 3000$ or $z = 4000$ directly instead of $x = 30$ or $z = 4$ in the regression equations.

Answers: (*b*) $y = 0.6314x + 12.3071$; (*c*) $r^2 = 0.313$; (*d*) Advertising expenditures;
(*e*) RM31 249.10, RM46 700.00

MATHEMATICS (M) 950/3

OVERALL PERFORMANCE

The number of candidates for this subject was 727. The percentage of candidates who obtained a full pass was 65.34%.

The achievement of candidates according to grades is as follows:

Grade	A	A–	B+	B	B–	C+	C	C–	D+	D	F
Percentage	9.22	7.43	4.95	10.87	11.97	12.10	8.80	5.64	4.54	3.44	21.05

RESPONSES OF CANDIDATES

General comments

The performance of the candidates showed a wide range of mathematical ability among STPM candidates. There was significant difference in the quality of scripts produced by different centres.

The answers presented by good candidates showed full understanding of Mathematical concept with nearly perfect working. They showed systematic analysis of the problems and good planning in their answers.

Comments on individual questions

Question 1

Candidates poorly attempted this question. Most of the candidates used wrong formula (future value instead of present value) when calculating the value of R. They were not familiar on how to calculate the present value for unpaid balance. Some candidates confused the monthly payment increasing rate with the interest rate. Most of the candidates could only obtain the marks for part (*a*).

Answers: (*a*) RM2 220.41; (*b*) RM94 545.76; (*c*) 35 months

Question 2

The performance of the candidates was good. Majority of the candidates lose marks in part (*b*); using the wrong equations to find the surplus. Only a few candidates were aware that the consumer's and producer's supply could be found without using integration.

Answers: (*a*) RM56, 40 units; (*b*) 280, 120

Question 3

Candidates performed moderately. Most of the candidates were able to shade the feasible region correctly but failed to answer optimal solution as multiple solutions with details.

Answers: (*b*) $x_1 = 1.58$, $x_2 = 1.68$, $C = 8$

Question 4

Candidates performed moderately. Most of the candidates tried to draw AOA network but did not perform well because the network involves dummy activity. Some candidates did not manage to get full mark due to no key was include. For part (*b*), some candidates wrongly wrote answer for critical activity as critical path.

Answers: (*b*) A, C, F

Question 5

This is a straightforward and easy question. The performance of candidates was quite good. However, many candidates faced some problems in obtaining holding cost. The wrong holding cost was affecting the answers for every step of the solution and finally they obtained the wrong answer. Some candidates were unable to calculate the order cycle time in days. Some candidates confused between number of order and reorder point and poorly interpreted the order point.

Answers: (*a*) 158 units; (*b*) 40 days; (*c*) 20 units

Question 6

Candidates performed badly and some shown no attempts. Almost all candidates failed to answer this question. The small portion who managed did not show their steps and justified their answer properly. Some of them tried to find range of k by letting k equal some value which was not accepted. Since most of them could not determine the range of k, they also failed to determine value of the game.

Answers: (a) $(+\infty, -\infty)$, 3; (b) Player *A*: Strategy I, Player *B*: Strategy I

Question 7

Candidates who chose to answer this question did quite well. Some candidates did not notice the equation $p = 500 - 2q$ is demand equation and $\bar{C}(q) = q + 50 + \dfrac{7\ 500}{q}$ is an average cost. They used it as revenue function and cost function and equal it to find breakeven quantity. Some candidates were unable to obtain correct revenue function and cost function. This causes the candidates were unable to obtain correct marginal revenue function and marginal cost function which end out with wrong quantity that would bring to the maximum profit. Besides that, it also caused wrong profit function and maximum profit. Some candidates could not relate the meaning of maximum profit and increases or decreases of the production. Hence, they failed to explain the effect.

Answers: (*a*) 20 pieces; (*b*) 75 pieces; (*c*) RM9 375.00;

Question 8

Most of the candidates chose to answer this question but only a handful reduced the pay-off matrix wrongly and causing them to lose a lot of marks. Some candidates lost mark because didn't write the strategy that not used when stating the optimal strategies. Some of the candidates were unable to determine the optimal mixed strategies based on the correct envelope.

Answers: (*a*) Does not has a pure strategy; (*c*) $P\left(0, \dfrac{5}{12}, \dfrac{7}{12}, 0\right)$, $Q\left(0, \dfrac{1}{4}, \dfrac{3}{4}, 0\right)$