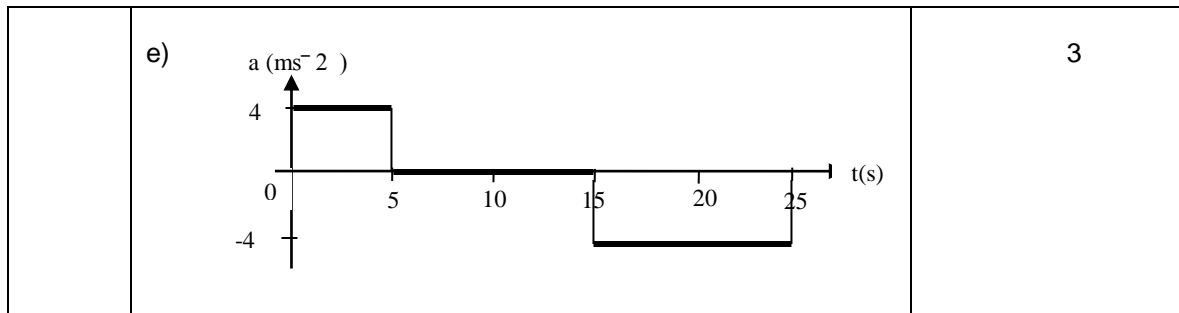


**Marking scheme**  
**Mid Year Examination 2017**

Subject : Physics Paper 2  
Form : 4A – 4F  
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Time : 7.35 – 10.05 am  
No. of Candidates : 255  
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| No | answer  | Marks   |
|----|---|---|
| 1  | (a) $X \rightarrow Y \rightarrow Z \rightarrow Y \rightarrow X$<br>(b) 32 s<br>(c) Scalar quantity  | 1<br>2<br>1                                     |
| 2  | a) vernier calipers<br><br>b) To determine the average value so that the accuracy is increased.<br><br>c) i) X : 2.40 cm<br>ii) Y : 2.40 cm<br><br>d) Same accuracy.<br>Average values and percentage errors are the same.<br><br>e) Reading X.<br>Because it's relative deviation is smaller. / student answer         | 1<br><br>1<br><br>2<br>2<br><br>2<br><br>2      |
| 3  | a)(i) Time interval between two consecutive dots<br>(ii) $ST$ is greater than $PQ$<br>(iii) Acceleration<br>b) Alternating current  | 1<br>1<br>1<br>1                                |
| 4  | a) Maximum velocity = 20 ms <sup>-1</sup><br><br>b) OA : the car accelerate<br>AB : the car at constant velocity<br>BC : the car decelerate<br><br>c) i) $a = \frac{v-u}{t} = 4 \text{ ms}^{-2}$<br><br>ii) $a = \frac{v-u}{t} = -4 \text{ ms}^{-2}$<br><br>d) Area under the graph OA + AB + BD = 50 + 200 + 0 = 250 m | 2<br><br>1<br>1<br>1<br><br>2<br><br>2<br><br>2 |



|   |  |   |
|---|--|---|
| 5 | <p>a) The tendency of an object at rest to remain at rest, or if moving, to continue moving / its motion in a straight line.</p> <p>b) i) the car</p> <p>ii) The car has a smaller mass, hence a smaller inertia compared to the lorry.</p> <p>c) <math>V^2 = U^2 + 2as</math><br/> <math>0 = 25^2 + 2a(345)</math><br/> <math>a = -0.9 \text{ m s}^{-2}</math></p> <p>d) 1. Use seatbelt<br/> 2. Use airbag / Headrest<br/> 3. Strong structure behind the driver's cabin<br/> 4. The tanks which carry liquid in a lorry should be divide into smaller tanks for safety.</p> | <p>3</p> <p>2</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> |
|---|--|---|

|   |  |   |
|---|--|---|
| 6 | <p>a.(i) 1. Magnitudes: <math>F_1 = F_2</math> and <math>F_3 = F_4</math><br/> 2. Directions: <math>F_1</math> is opposite to <math>F_2</math> and <math>F_3</math> is opposite to <math>F_4</math></p> <p>(ii) Zero</p> <p>(iii) Newton's third law of motion/ Forces in equilibrium</p> <p>b) (i) The trolley experiences acceleration<br/> (ii) Because the forces are unbalance (<math>F_3 &gt; F_4</math>) and produce a net force, <math>F = ma</math></p> | <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> |
|---|--|---|

|         |  |                   |          |
|---------|--|-------------------|----------|
| 7(a)(i) | <p><b>Give the correct substitution</b></p> $a = \frac{40-0}{20}$ <p><b>Answer with correct unit</b></p> $2.0 \text{ ms}^{-2}$ | <p>1</p> <p>1</p> | <p>2</p> |
| (a)(ii) | <p><b>Give the correct substitution</b></p> $F = 2900 \times 2.0$ <p><b>Answer with correct unit</b></p> $5800 \text{ N}$      | <p>1</p> <p>1</p> | <p>2</p> |

|         |  |        |   |
|---------|--|--------|---|
| (b)(i)  | <b>Give number of tyres correctly</b><br>increase the distance between driver and tank<br><b>Give the correct reason</b><br>reduces the effect of inertia  | 1<br>1 | 2 |
| (b)(ii) | <b>Give the number and size of tanks correctly</b><br>. use many small tanks // divide large tanks to small tanks<br><b>Give the correct reason</b><br>reduces the effect of inertia   | 1<br>1 | 2 |
| (c)(i)  | <b>Give the meaning of speed correctly</b><br><u>distance</u> // rate of change of distance<br>time  | 1      | 2 |
| (c)(ii) | <b>Give the correct reason</b><br>momentum of heavy vehicle depends on the speed /<br>directly proportional to the speed or greater<br>momentum causes more damage / difficult to control<br>direction / greater impulsive force when accident<br>occurs | 1      |   |

### SECTION B

[20 marks]

Answer all questions from this section

8.

(a) Rate of change of velocity [1m]

(b) (i) - Runner A has a smaller mass than runner B. [1m]

- Runner A has covered a longer distance than runner B.

(ii) The longer the distance covered, the larger the acceleration of the runner. [2m]

(iii) The smaller the mass of the runner, the larger the acceleration. [1m]

(iv) Inertia [1m]

(c) - the rocket burns fuel and expels the hot gases [1m]

- the backwards momentum of the hot gases causes the rocket to have an equal but upwards momentum, according to the principle of conservation of momentum [2m]

- the rocket gets lighter as the fuel burns up and so accelerates [1m]

(d)

|                 | Design      | Explanation                            |
|-----------------|-------------|--|
| Mass            | Light       | Can stay in the air longer             |
| Design          | Aerodynamic | Less air resistance and so can fly far |
| Speed of launch | High speeds | Can travel far                         |
| Angle of launch | At 45°      | Can travel far                         |

[10m]

|              |   |  |           |
|--------------|---|--|-----------|
| 9(a)         | The rate of change momentum.  | 1  | Total :1  |
| (b)          | 1. High velocity momentum is bigger/<br>2. Momentum depend mass and velocity /<br>3. When it suddenly stop in a crash , the bikers move forward and injuries./<br>4. Impulsive force $\propto 1/(\text{time of impact})$ , $F \propto 1/t.$ /<br>5. Increases the time of impact./<br>6. Helmet - to protect the head /<br>7. Jacket - to protect the body from injuries, cuts, burn etc/<br>8. Gloves – to protect the hand<br>* Any four points above | 1<br>1<br>1<br>1<br>1<br>1<br>1  | 4         |
| (c)          | <b>Specification</b>  | <b>Reason</b>  |           |
|              | With ABS  | Motorcycle does not stop immediately/ can be controlled if direction changes/ does not move sideways / more friction with ABS. | 2         |
|              | Bigger width of tyre  | Bigger surface area, better support / low pressure acts on the tyres/ more friction when breaks.                               | 2         |
|              | Smaller mass  | Lighter, can move faster / low inertia.  | 2         |
|              | Lower seat height   | Lower centre of gravity/ more stable/ safer when turn.   | 2         |
|              | Choose racing bike c  | It has ABD, bigger width of tyre, smaller mass, lowest seat height.  | 2         |
| (d)(i)       | $V = \frac{160 \times 1000}{60 \times 60} = 44.4 \text{ ms}^{-1}$<br><br>$a = \frac{v - u}{t}$<br>$= \frac{44.4 - 0}{10}$<br>$= 4.44 \text{ ms}^{-2}$   | 1<br><br><br>1<br><br>1  | 2         |
| (ii)         | $F = ma$<br>$= (202)(4.44)$<br>$= 896.88 \text{ N.}$  | 1<br>1   | 2         |
| <b>TOTAL</b> |   |  | <b>20</b> |