MECS JOINT EXAMINATION

**MATHEMATICS**

**121/1**

**PAPER 1**

**END OF TERM 2 - SEPTEMBER, 2022**

Form 4

**MARKING SCHEME**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 1. | $\frac{2}{3}+\frac{5}{6}$ = $\frac{4+5}{6}= \frac{9}{6}- \frac{5}{4}= \frac{18-15}{12}= \frac{3}{12}= \frac{1}{4}$$\frac{16}{3}+\frac{9}{10}$= $\frac{160+27}{30}= \frac{187}{30} \frac{16}{5}×\frac{7}{8} × \frac{11}{6}= \frac{77}{15}$$\frac{2}{7}+\frac{77}{15}= \frac{30+539}{105}= \frac{569}{105}$ - $\frac{187}{30}= $ = $\frac{-57}{70} $$\frac{1}{4}×\frac{-70}{57}$ = $\frac{-35}{144}$ | M1M1 A1 |  |
| 2. | $$\sqrt{6.458 ×10^{-2}}+ 2 \left(\frac{1}{0.4327}\right)^{2}$$2.541x10-1 + (2x2.311)2= 0.2541 + (4.622)2= 0.2541 + 21.363=21.62  | M1M1M1A1 |  |
| 3. | log29 + log2 $\left(x^{2}- \frac{x}{3}\right)=log\_{2}^{2}$$$9x^{2}- 3x-2=0$$$$\left(3x+1\right)\left(3x-2\right)=0$$$x= \frac{-1}{ 3}$ or $\frac{2}{3}$ | M1M1A1 |  |
| 4 | 840 = $2^{3}×3×5×7$ $$396= 2^{2}×3^{2}×11$$G.C.D = $2^{2}×3^{2}=12$Area = 12 $×12=144$ | M1M1A1 |  |
| 5 |

|  |  |
| --- | --- |
| Mass(kg)  | frequency |
| 41-50 | 20 |
| 51-55 | **25** |
| 56-65 | 40 |

 | B1B1B1 | For frequencyFor each bar |
| 6 | 2x – 2 $\leq 3x+1$-2 – 1 $\leq 3x-2x$-3 $\leq x$ B1 for -3$\leq x$3x + 1 < x + 112x < 10X<5 B1 for x < 5-3 $\leq x<5$Integral values -3,-2, -1, 0, 1,2,3,4 B1 – All correct integral values | B1B1B1 |  |
| 7 | Sum of int. angles = $\left(2n-4\right)90=\left(2\left(6\right)-4\right)90=720$$$\frac{1}{2}+4x+40+2x+160+110+130=720$$$$x=80$$smallest angle$=40^{0}$ | M1M1A1 |  |
| 8 | AC = $\sqrt{(85^{2}-75^{2})}$ = 40MArea of quadrilateral A B C D= $\frac{1}{2}×40×75+75+75(75-60)(75-50)(75-40)$= 2492m2In hectares; 2492 = 0.2492 ~ 0.25ha 10,000 | M1M1A1B1 | Sum of both areasFor areaIn hectares to 2 decimal places. |
| 9 | (i) In 1 hour: 11 x 3600 = 7920cm3 5 Capacity of water lost = 7.92 litres(ii) Volume of tank = 3.142 x 302 x 30 = 84834cm3 = 84.834 litres Time = 84.834 7.92 = 10.711 ~ 10.71 hours | M1A1M1A1 |  |
| 10 | $$\left(\frac{3^{3}}{2^{3}}\right)^{x+7}=\left(\frac{3^{2}}{2^{2}}\right)^{3x}$$$$\left(\frac{3}{2}\right)^{3x+21}=\left(\frac{3}{2}\right)^{6x}$$3x + 21 = 6x3x = 21x = 7 | M1 M1A1 |  |
|  |  | 03 |  |
| 11 |  1 + T = - 1  2 2  T = -1 - 1 2 2  = -2 0  x + - 2 = -3 y 0 -3  x = -3 - -2 y -3 0  = -1 -3  R(-1, -3) | B1M1 A1 |  |
| 12 | No. of oranges sold on Monday; 6144 = 768 8No. of oranges that remained on Sunday; 768 – 560 = 208No. of oranges bought on Saturday. 208 + 750 + 750 + 240 = 1948 | M1M1M1A1 | √ division √ subtraction √ Addition |
| 13 | $$\frac{2x-3}{3}- \frac{x-2}{2}- \frac{1-x}{4}= \frac{4\left(2x-3\right)- 6\left(x-2\right)-3\left(1-x\right)}{12}$$$$ = \frac{8x -12-6x+12-3+3x}{12}$$$$ = \frac{5x -3}{12}$$ | M1M1A1 |  |
| 14 | Vol of water: ¾ x 2.5 = 1.875lVol of ethanol ¼ x2.5 = 0.625lMass of water 1875 x 1 = 1875gMass of ethanol 625 x 1.2 = 759gMass of mix= 1875 + 750=2625g | M1M1A1 |  |
| 15 | 9.74 x 105,000=Ksh.1,022,7001,022,700-403897=Ksh.618,803$\frac{618803 x 100}{75.12}$= 832,752.66 yen | M1M1A1 |  |
| 16 | `1C:\Users\hp\Desktop\orthocentre.jpg | B1B1B1 | For √ const. of 600 For 2 correctly dropped perpendicular For identifying point X. |
|  |  | 3 |  |
| 17 | 1. $m\_{1}=\frac{6-3}{-1+2}=3$

$\frac{3}{1}=\frac{y-3}{x+2}$ $$y-3=3\left(x+2\right)$$$$y=3x+9$$1. $m\_{2}=-\frac{1}{3}$

$$\frac{-1}{3}=\frac{y-6}{x+1} $$$$3y-18=-x-1 $$$$x+3y-17=0$$1. $m\_{3}=3$

$$\frac{3}{1}=\frac{y-2}{x-2}$$ $y=3x-1$At $x$ intercept; $y=0, x=\frac{1}{3};x-intercept= \frac{1}{3}$ At y intercept; $x=0, y=-1;y intercept=-1$1. At point of intersection, y values are equal

$$3x-1=\frac{-x}{3}+\frac{17}{3}$$$$9x-3=-x+17 $$$$10x=20; x=2$$$$y=3\left(2\right)-1=5$$Point of intersection (2, 5) | M 1A 1M 1A 1M 1A 1A 1M 1M 1A 1 |  |
|  |  | 10 |  |
| 18 | (a) 108 x 22 x 20 x 20 36 7  377.14(b) 3.77.14 = $\frac{22}{7}$ x r x 20  r = 377.14 x 7 22 x 20 r = 6.0(c) h2 + 62 = 202 h = $\sqrt{20^{2} – 6^{2}}$ h = 19.079 h = 19.1(d) 19.08 = 6  12 r r = 3.774 Volume of smaller cone =$\frac{1}{3}$ ×$\frac{22}{7}$ (3.774)2 x 12 = 179.1 Volume of larger cone $\frac{1}{3}$ ×$\frac{22}{7}$ (6)2 x 19.08 = 719.6 719.6 - 179.1 = 540.5 | M1A1M1M1A1M1A1M1M1A1 | Expression for the 2 Volume Subtraction  |
|  |  | 10 |  |
| 19 | (a) (b) (i) 9.6 km + 0.1 750 + 0.1 (ii) 5.8 km + 0.1 2460 + 0.1(iii) Area = ½ x 7 x 5 sin 1050 – ½ x 4 x 5.8 sin 154 = 16.90370196 – 5.085105303 = 11.81859666 = 11.82 cm2  | B1B1B1B1B1B1 B1M1 M1A1 | Location of point QLocation of point RLocation of point S.Distance of R from PBearing of R from PDistance of P from SBearing of P from SFollow through |
|  |  |  |  |
| 20 | $w$ = $\frac{28}{X}$Area = $\left(x-1\right)\left(\frac{28}{x}-1\right)$ = $\frac{3600}{200}$$\left(x-1\right)$ $\left(\frac{28}{x}-1\right)$ = 18 28 – $x$ - $\frac{28}{x}$ + 1 – 18 = 0 -$x$ - $\frac{28}{x}$ + 11 = 0 $x^{2}$ + 28 - 11$x$ = 0$x^{2}$ - 11$x$ + 28 = 0$x^{2}$ - 7$x$ - 4$x$ + 28 = 0$x\left(x-7\right)$ - 4$\left(x-7\right)$ = 0 $\left(x-7\right)$ $\left(x-4\right)$ = 0$x$ = 7 or $x$ = 4Length = 7mArea not previously covered = 28 – 18 $m^{2}$ = 10 $m^{2}$Cost = 10 × $\left(200+150\right)$ = 10 × 350 = sh. 3500 | B1B1M1 M1M1M1A1M1M1A1 **10** | For 28For $\frac{28}{X}$For $\frac{3600}{200}$ and area  Accept alt |
| 21 |  | B1B1B1B1M1M1A1M1M1A1 |  |
| 22 | 1. $Distance of A before B started=65 ×2\frac{1}{6}$

$$ =140.83km$$$$Distance shared=460-140.83$$$$ =319.17km$$$$Time to meet=\frac{319.17km}{145}$$$$ =2.2011hrs$$$$Distance from B =80 ×2.2011$$$$ =176.09km$$1. $Time ≈2hrs 12 minutes$

$$Meeting time=1055hrs+2hrs 12 min$$$$ =1307hrs$$$$ =1.07pm$$1. $Time taken by minibus= \frac{460}{65}$

$$ ≈7 hrs 05minutes$$$$Time to reach B= 0845hrs+7 hrs 5 mins$$$$ =1550hrs$$$$ = 3.50pm$$$$Time of the motorist= 1550hrs-0915hrs$$$$ =6hrs 35minutes$$$$Distance= 120×6\frac{35}{60}$$$$ =790km$$ | M1M1M1A1M1A1M1M1M1A1 |  |
| 23 | (a) 250 x 14 x 2 x 2 = 14000 Net profit = 14000 – 6000 = KSh. 8000(b) 8000 x 25 = 200,000 = 190,000(c) Saving: $\frac{40}{100}$ x 190,000 = 76000Remaining profit = $\frac{36}{100}$ x 190,000 = 68,400Muthoka’s share$\frac{45,600}{3}$ + $\frac{2}{9}$ x 68,400 = 30,400(d) 475,000 x 3 x 100 95= 1,500,000 | M1 ✓ProfitA1B1 ✓ProfitM1 ✓Equation for equal shareA1M1 ✓Expression of Muthoka’s shareA1M1M1A1 |  |
|  |  | 10 |  |
| 24 | (a) Initial acceleration is at t = 0$V=\frac{ds}{dt}$ = - 6$t^{2}$ + 3t + 3a = $\frac{dv}{dt}$ = -12t + 3when t = 0, a =[ 0 + 3∴ a = 3m/s2(b) (i) at rest V = 0-6$t^{2}$ + 3t + 3 = 0(2t + 1) (t-1) = 0t = -$\frac{1}{2}$ or t = 1 (t = -$\frac{1}{2}$ not applicable)(ii) S = -$2t^{3}$ + $\frac{3}{2}t^{2}$ + 3tWhen t =m 1, s = -2$(1)^{3}$ + $\frac{3}{2}$ $(1)^{2}$ + 3 (1)2.5M(c) When velocity is maximum, a = 0-12t + 3 = 0 t = $\frac{1}{4}$Max v = -6 $\left(\frac{1}{4}\right)^{2}$ + 3$\left(\frac{1}{4}\right)$ + 3 = 3.375 m/s | M1 M1A1M1M1A1 for t = 1M1 SubstitutionA1M1For substitutionA1 |  |
|  |  | 10 |  |