DEPARTMENT OF GOVERNMENT EXAMINATIONS CHENNAI 600006

HIGHER SECONDARY SECOND YEAR EXAMINATION MARCH 2020

MATHEMATICS MARKING SCHEME –ENGLISH MEDIUM

1. The answers given in the marking scheme are NEW TEXT BOOK and SOLUTION BOOK issued 2020.
2. If a student has given any answer which is different from one given in the marking scheme, but carries prescribed content meaning (rigorous) such answers should be given full credit with suitable distribution.
3. Follow the footnotes which are given under certain answer schemes.
4. If a particular stage is wrong and if the candidate writes the appropriate formula then award 1 mark for the formula (for the stage mark 2*). This mark (*) is attached with that stage. This done with the aim that a student who did the problem correctly without writing the formula should not be penalized.
5. In the case of Part II,Part III and Part IV , if the solution is correct then award full mark directly . The stage mark is essential only if the part of the solution is incorrect.
6. Answers written only in BLACK or BLUE Ink should be evaluated.

CODE A			CODE B		
Q No.	Option	Answer	Q.No.	Option	Answer
1	(2)		1	(3)	2xu
2	(2)	$\frac{\sqrt{7}}{\sqrt{2}}$	2	(4)	N
3	(3)	t=1/3	3	(3)	3
4	(3)	2xu	4		M/A
5	(4)	(0, 1/8)	5	(3)	Consistent
6	(3)	Consistent	6	(4)	(0, 1/8)
7	(2)	$\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$	7	(3)	
8	(4)	40	8		M/A
9		M/A	9	(3)	xoy plane
10	(4)	Undefined	10	(3)	3
11	(4)	N	11	(4)	Undefined
12	(4)	$\sqrt{10}$	12	(1)	$\tan^{-1}$ (1/2)
13	(3)	3	13	(3)	t=1/3
14	(1)	2	14	(4)	40
15	(3)	xoy plane	15	(1)	2
16		M/A	16	(4)	$\sqrt{10}$
17	(3)	3	17	(2)	$\frac{\sqrt{7}}{\sqrt{2}}$
18	(3)		18	(2)	$\begin{bmatrix} 2 & -5 \\ -3 & 8 \end{bmatrix}$
19	(2)	1,2	19	(2)	
20	(1)	$\tan^{-1}$ (1/2)	20	(2)	1,2

PART II

QUESTION NO.	CONTENT	MARK
21	— = ——— = i ----(1) — = - i -----(2) (1)+(2) = i^3 - $(-i)^3$ = -2i	1(*) 1
22	(1+i) (1+2i) (1+3i)........(1+ni) = x+iy Taking Modulus on both sides |1+i|| 1+2i||1+3i|........|1+ni|=|x+iy| $\sqrt{}\sqrt{}\sqrt{}$........... $\sqrt{}$ $\sqrt{x}$ Squaring on both sides 2.5.10..........(^{2})= ^{2})	1 1
23	Sin $^{-1}$ [sin ($\frac{5\pi}{}$)] = Sin $^{-1}$ [Sin (–] = Sin $^{-1}$ [Sin (- –)] = - –	1 1
24	Given $\vec{r}$ = -2 $\vec{i}$ + $\bar{k}$ -------------- $\vec{F}$ = 2$\vec{i}$ + $\jmath$ $\bar{k}$ Torque = $\vec{r}$x $\vec{F}$ = -$\vec{i}$ - 2 $\vec{k}$ ------------- Magnitude = $\sqrt{1\ +\ \ }$ = $\sqrt{5}$ ------------ D . C's = (- $\frac{1}{\sqrt{5}}$, 0 , - $\frac{2}{\sqrt{5}}$) ------------	1 1
25	f(x) is continuous in [½ ,2] and f(x) is exists in (½ ,2) f(1/2) = f(2) = 5/2 By Rolle's Theorem f'(c) =0	1

	$C = \pm 1$ but $c = 1 \in (\frac{1}{2}, 2)$	1(*)
26	$f(x) = x^2 + 3x$ given $x = 2$ and $dx = 0.1$ $df = (2x + 3)\, dx$ $df = (4 + 3)(0.1)$ $= 7(0.1)$ $= 0.7$	1 1
27	$I = \int^{-}$ ———— dx ----------- (1) Use Property $\int$ $\int$ $I = \int^{-}$ ———— dx -----------(2) Add (1) and (2) $2I = \int_0^{\frac{-}{2}} dx = [x] = -$ $I = -$ Hence it is proved	 1 1
28	$Y^2 = 4ax$ -------------- (1) Diff w.r.to. x , we have $2y$ — $= 4a$ -------------(2) Substitute (2) in (1) $Y^2 = 2y \frac{dy}{} x$ $Y = 2$ — x	 1 1
29	Let e_1 and e_2 be the identity elements Treating e_1 is the identity element $e_1 * e_2 = e_2 * e_1 = e_2$ ----------- (1) Treating e_2 is the identity element $e_1 * e_2 = e_2 * e_1 = e_1$------------ (2) From (1) and (2) $e_1 = e_2$ Hence, identity element is Unique	 1 1

30	Given $(y-k)^2 = -4a\,(x-h)$ Also Given $(h,k) = (2,1)$ $(y-1)^2 = -4a\,(x-2)$ It passes through (1,3) $4 = -4a\,(-1)$ $a = 1$ $(y-1)^2 = -4(x-2)$	1(*) 1

PART III

In an answer to a question, between any two particular stages of mark (greater than one) , if a student starts from a stage with correct steps, but reaches the next stage with a wrong result then suitable credit should be given to the related steps instead of denying entire marks meant for the stage.

Question No.	Content	Marks Stages
31	$A = \begin{bmatrix} 2 & 9 \\ 1 & 7 \end{bmatrix}$ $\quad |A| = 14-9 = 5$ $A^T = \begin{bmatrix} 2 & 1 \\ 9 & 7 \end{bmatrix}$ $\quad |A^T| = 14-9=5$ $(A^T)^{-1} = -\begin{bmatrix} 7 & -1 \\ -9 & 2 \end{bmatrix}$ -------- (1) $A^{-1} = -\begin{bmatrix} 7 & -9 \\ -1 & 2 \end{bmatrix}$ $(A^{-1})^T = -\begin{bmatrix} 7 & -1 \\ -9 & 2 \end{bmatrix}$ --------- (2)	1(*) 1

	From (1) & (2) $(A^{-1})^{T} = (A^{T})^{-1}$	1
32	$4x^2 + 4px + p + 2 = 0$ $D = b^2 - 4ac = (-4p)^2 - 4(4)(p+2)$ $= 16(p+1)(p-2)$ D <0 if $-1<p<2$ then the roots are imaginary D =0 if p=-1 or p=2 then the roots are real D >0 if - or $2 < p < \infty$ then the roots are distinct	1(*) 2(*)
33	 $x^2 = -4ay$ (20,-15) and (20,-15) lies on the parabola $4a = 400/15$ Hence the required equation of parabola is $3x^2 = -80y$	1 1 1(*)
34	$\vec{a} = -$ + 7 $4\vec{k}$ $\vec{b} = 13$ - 5 $2\vec{k}$ Required Vector Equation is $\vec{r} = \vec{a}$ $\vec{b} - \vec{a}$) = + $7\vec{j} - 4\vec{k}$)+ t ($18\vec{i}$ -12 $6\vec{k}$ (OR) =($-5\vec{i}$ + 7 $4\vec{k}$)+ t ($3\vec{i}$ -$2\vec{j} + \vec{k}$ Cartesian Equation is ——— = ———= ———	1(*) 1(*)

	—— = ——= —— It Crosses the xy plane ie., z=0 —— = ——= – The Point of intersection is(7,-1,0)	(1*)
35	f'(x) = $\frac{}{\sqrt[5]{x}}$ f'(x)=0 ➔ x=4 ,8/7 f'(x) is not defined ➔x=0 Critical Numbers are 0,4,8/7	(1) (1) ½ ½
36	— = ———— — = ———— — = ———— — + — +— = ————	(1) (1) (1)
37	P(2<x<6) = 17k (OR) —	(3*)
38	k ∫ ^{10}dx =1 k=132	(2*) (1)
39	(see table below) p -> q ≡	2 (*) (1)
40	Cartesian Equation of Plane can be obtained by 2 Ways or 2 Types (i) By taking any one point and two parallel vectors from the given	(1) (1*)

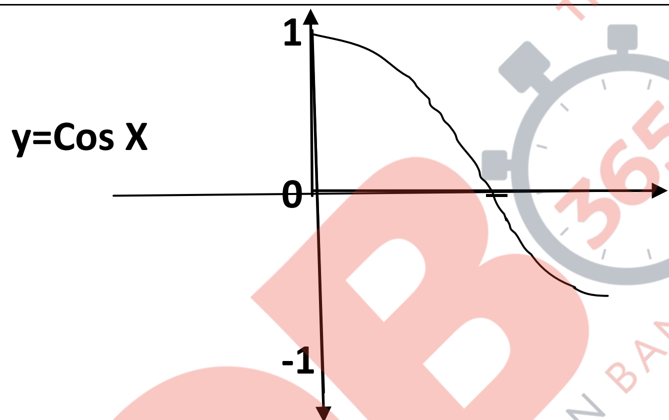
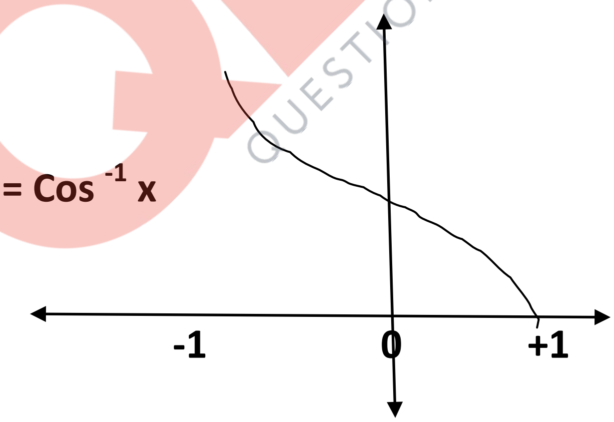
p	q		p->q	Vq
T	T	F	T	T
T	F	F	F	F
F	T	T	T	T
F	F	T	T	T

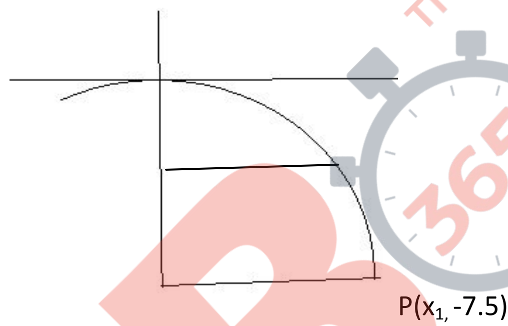
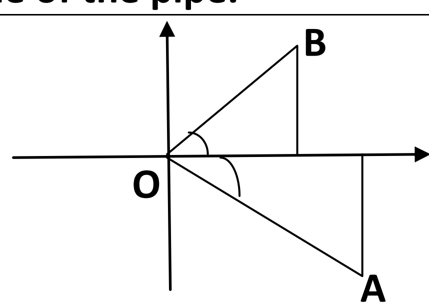
	lines (ii) By taking any One Parallel vector and two points from the given lines	(1*)

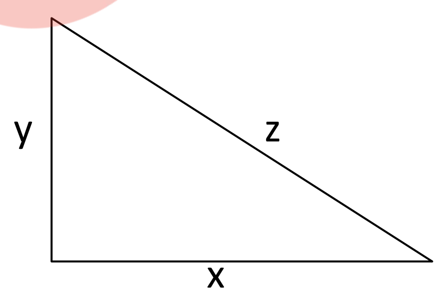
PART IV

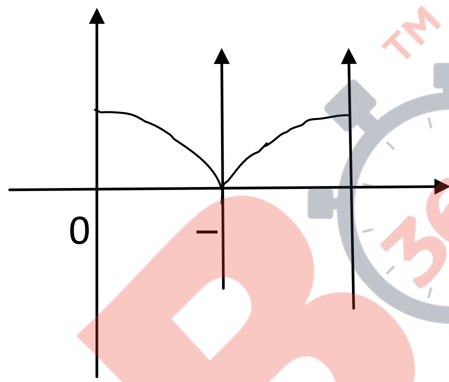
In an answer to a question, between any two particular stages of mark (greater than one) , if a student starts from a stage with correct steps, but reaches the next stage with a wrong result then suitable credit should be given to the related steps instead of denying entire marks meant for the stage.

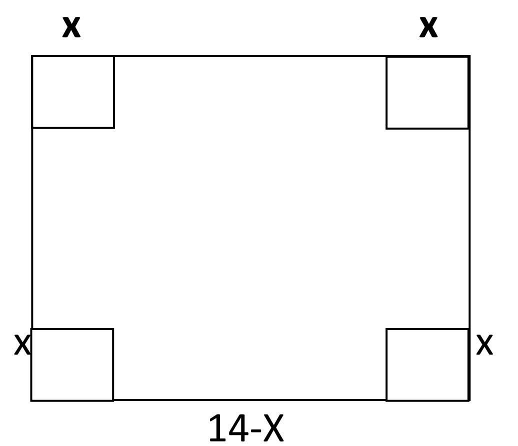
Question No.	Content	Stage Marks
41 (a)	$[A/B] = \begin{pmatrix} 1 & -1 & 1 & -9 \\ 2 & -1 & 1 & 4 \\ 3 & -1 & 1 & 6 \\ 4 & -1 & 2 & 7 \end{pmatrix}$	(1)
	$[A/B] = \begin{pmatrix} 1 & -1 & 1 & -9 \\ 0 & 1 & -1 & 22 \\ 0 & 0 & 1 & -23 \\ 0 & 0 & 0 & -11 \end{pmatrix}$	(2)
	OR Any other echelon form (A/B) =4 (OR)	(1)
	Therefore ,It is Inconsistent	(1)
41(b)	$\left.\begin{array}{l} x = \text{Cos} \quad + i \text{ Sin} \\ y = \text{Cos} \quad + i \text{ Sin} \end{array}\right\}$	(1)

	— = Cos (m + i Sin (m — = Cos (m - i Sin (m — — = 2i Sin (m = Cos (m + i Sin (m —— = Cos (m - i Sin (m +—— = 2 Cos (m	(1) (1) (1) (1)
42 a)	 	3 2

42 (b)	The Equation of the circle is + 2gx +2fy +c =0 2g + 2f +c = -2 4g- 2f + c = -5 6g+4f+c =-13 f= - – ; g = - – ; c=4 - 5x - y + 4 =0	(1) (1) (2) (1)
43 (a)	 ^{2}= - 4ay (3,-2.5) lies on the parabola a = — ^{2}= - 4(— y At P($x_{1,}$-7.5) x_1=3 $\sqrt{3}$ m The water discharge 3 $\sqrt{3}$ m from the vertical line of the pipe.	(1) (1) (1) (1) (1)
43 (b)	 $\vec{a}$ = Cos - Sin $\vec{b}$ = Cos + Sin	(1) (1)

	$\vec{a}\,.\,\vec{b}$ = Cos α Cos β - Sin α Sin $\vec{a}\,.\,\vec{b}$ = Cos Cos = Cos α Cos β - Sin α Sin	(1) (1) (1)
44 (a)	$\vec{a} = \vec{j}$ - 5 $\bar{k}$ $\vec{b}$ = 2 $\vec{i}$ + 3$\vec{j}$ + 6$\vec{k}$ $\vec{c}$ = $\vec{i}$ + + $\vec{k}$ Required Vector equation is $\vec{r}$ = ($\vec{j}$ - 5 $\vec{k}$) + s (2 $\vec{i}$ + 3$\vec{j}$ + 6$\vec{k}$) + t ($\vec{i}$ + $\vec{j}$ + $\vec{k}$) Required Cartesian equation is 9x – 8y + z +13 = 0	(1) (2*) (2*)
44 (b)	I = $\int$ —— -------- (1) I = $\int$ —— -----------(2) (1) + (2) 2I = $\int$ = 2 $\int$ —————— dx = –	(1) (1) (1) (1) (1)
45(a)	 — = -60 Km/hr — = 20 Km/hr — = ? when x = 0.8 and y = 0.6	(1)

	By Pythagoras theorem $x^2 + y^2 = z^2$ when x = 0.8 and y = 0.6 z = 1 $x^2 + y^2 = z^2$ 2x — + 2y — = 2z — — = 70 Km / hr	**(1)** **(1)** **(1)** **(1)**
45 (b)	 y = { –, – } Area A = $\int^{-}$ + $\int_{-}$ = 2	**(1)** **(1)** **(2*)** **(1)**

46 (a)		**(1)**
	Area $a^2 = 196$ Side a = 14 Volume $V = x(14 - x)^2 = 196x + x^3 - 28x^2$	**(1)**
	$V' = 196 + 3x^2 - 56x$	(1)
	put v' =0 , $x = \frac{49}{3}$ or – $v'' = 6x - 56$ When $x = \frac{49}{3}$,V''>0 $x = \frac{7}{3}$,V'' <0	**(1)**
	Volume is maximum when side is reduced by –	(1)

46)b)	$M\frac{dv}{dt}$ = F – KV — + — V = — I.F = — The solution is V — = — — — + c or V= — + c — t=0, v=0 c = — V = — (1 - —)	(1) (1) (1) (1) (1)
47)a)	— = k (T – 50) —— = dt T - 50 = c k (i) t =0 ,T = 70 c= -20 (ii) t = 2, T = 60 -10 = -20 k = –log(–) 50- T= -20 – – T =50+20 – – T = 98.6 t = -2.56 Time of death is 5.26 p.m	(1) (1) (1) (1) (1)

<table>
<tr>
<td>47(b)</td>
<td>Probability mass function is
<table>
<tr><td>X=x</td><td>0</td><td>1</td><td>2</td><td>3</td></tr>
<tr><td>P(X=x)</td><td>1/8</td><td>3/8</td><td>3/8</td><td>1/8</td></tr>
</table>

$E(x) = –$
$E(x^2) = 3$
Mean = –   Variance = –
Verification: Binomial Distribution
n = 3, p = – ,   q = –
Mean = np = –
Variance = npq = –</td>
<td>(1)

(2*)

(1)

(1)</td>
</tr>
</table>