HIGHER SECONDARY MODEL EXAMINATION, FEBRUARY 2015

Max. Score: 80

Part III **Time : $2\frac{1}{2}$ Hrs.**

First Year **MATHEMATICS (SCIENCE)** **Cool off Time: 15 Mts.**

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ANSWER KEY

[1] A = {2, 3, 5, 7}, B = {1, 2, 3, 4, 6, 12},

AUB = {2, 3}, B – A= {1, 4, 6, 12}, AUB – A = {1, 4, 6, 12}, 2^6 elements,

[2] $AXB = \{(1, a), (1, b), (2, a), (2, b), (3, a0, (3, b)\}$, 63

[3] Drow the graph of f(x) = - |x| , Domain = R , Range = (- ∞ , 0]

[4] $3(2 - x) \geq 2(x - 3) => 6 - 3x \geq 2x - 6 => -5x \geq -12$, x ≤ $\frac{12}{5}$

Solve 3x + 4y ≤ 60, x + 3y ≤ 60

[5] - tan x , tan $\frac{\pi}{3}\sqrt{3}$, tan $\frac{4\pi}{3}\sqrt{3}$, $x = n\pi + \frac{\pi}{3}$

[6] P (n) : 1.2 +2. 2^2 + ……..+ $n.2^n$ = (n – 1) 2^{n+1}+2

P (n) : 1.2 = 2 , => P(1) is true

Assume that P (k) : 1.2 +2. 2^2 + ……..+ $k.2^k$ = (k – 1) 2^{k+1}+2 is true

1.2 +2. 2^2 + ……..+ $k.2^k + (k+1).2^{k+1}$ = (k – 1) 2^{k+1} +2 + $(k+1).2^{k+1}$

= ((k+1) – 1) $2^{(k+1)+1}$ +2 = P(k+1)

[7] i^3 , z = 1 + i , r = $\sqrt{2}$, cos $\theta = \frac{1}{\sqrt{2}}$, sin $\theta = \frac{1}{\sqrt{2}}$, $\theta = \frac{\pi}{4}$, z = 1 + i = $\sqrt{2}$ (cos $\frac{\pi}{4}$+ i sin $\frac{\pi}{4}$)

$\sqrt{3}x^2$ + x+ $\sqrt{3}$ = 0 => x = $\frac{-1 \pm \sqrt{1-12}}{2\sqrt{3}} = \frac{-1 \pm i\sqrt{11}}{2\sqrt{3}}$

[8] 2 , $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \frac{2\sin 4x \cos x}{2\cos 4x \cos x}$ = tan 4x

[9] 2n + 1 , $T_{n+1} = 2nC_{n+1}\, x^{n+1} = \frac{2n!}{(n+1)!\,.(n+1)!}$

[10] $\frac{12!}{4!.2!.3!}$ = 1663200 , $\frac{11!}{4!.2!.3!}$ = 138600 , $\frac{8!}{3!.2!} \times \frac{5!}{4!}$ = 16800 , 9 x 8 x 7 x 6 = 3024

OR

[10] n = 10 , 21 C_2 = 210 , 15 C_{11} = 32760 , 5 C_2. 6 C_3. 4 C_2 = 10. 20. 6 = **<u>1200</u>**

[11] 25 , d = - 1 , a_p = m + n – p , a = 3 , d = 3 , a_5 = 15, **<u>Numbers are 6, 9, 12</u>**

[12] slope, m = $\frac{2-4}{-7-5}$ = $\frac{-2}{-12}$, distance, d = $\left|\frac{3x3-4x5-26}{\sqrt{3^2+4^2}}\right|$ = $\frac{3}{5}$,

$\sqrt{(\sqrt{3})^3+1^2}$ = 2 , x $\frac{\sqrt{3}}{2}$ + y $\frac{1}{2}$ + = $\frac{8}{2}$, p = 4, $\omega = \frac{\pi}{6}$

[13] 0 , $\frac{3 \text{ x } m+1 \text{ x}-2}{m+1}$ = 0 => 3m = 2 => m = $\frac{2}{3}$, Ratio 2 : 3 internally.

[14] $\frac{x^2}{25} + \frac{y^2}{9}$ = 1=> a = 5, b = 3 , c = $\sqrt{25-9}$ = $\sqrt{16}$ = 4, e = $\frac{c}{a}$ = $\frac{4}{5}$

Length of major axis = 2a = 10, Length of minor axis = 2b = 6, Latus rectum = 2 $\frac{b^2}{a}$ = $\frac{18}{5}$

[15] 1 , $\lim_{x\to 0} \frac{\sin ax+bx}{ax+\sin bx} = \lim_{x\to 0} \frac{\frac{\sin ax+bx}{ax}.ax}{\frac{ax+\sin bx}{bx}.bx} = \frac{a}{b}\lim_{x\to 0} \frac{\frac{\sin ax+bx}{ax}}{(\frac{ax+\sin bx}{bx}} = \frac{a}{b}\lim_{x\to 0} \frac{\frac{\sin ax}{ax}+\frac{bx}{ax}}{\frac{ax}{bx}+\frac{\sin bx}{bx}}$

$= \frac{a}{b} \frac{\frac{\sin ax}{ax}+\frac{bx}{ax}}{\frac{ax}{bx}+\frac{\sin bx}{bx}} = 1$

[16] f(x) = sin x

f'(x) = $\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ = = $\lim_{h\to 0} \frac{\sin(x+h)-\sin x}{h}$ = $\lim_{h\to 0} \frac{2\sin(x+\frac{h}{2}) COSX}{h}$

= $\lim_{\frac{h}{2}\to 0} \frac{\sin(x+\frac{h}{2})}{\frac{h}{2}} \lim_{h\to 0} \cos x$ = 1. cos x = cos x

OR

[16] f(x) = tan x

$$f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

$$= \lim_{h\to 0} \frac{\tan(x+h)-\tan x}{h}$$

$$= \lim_{h\to 0} \frac{\tan(x+h)-\tan x}{h}$$

$$= \lim_{h\to 0} \frac{\frac{\sin(x+h)}{\cos(x+h)} - \frac{\sin x}{\cos x}}{h}$$

$$= \lim_{h\to 0} \frac{\sin(x+h)\cos x - \cos(x+h)\sin x}{h\cos(x+h)\cos x}$$

$$= \lim_{h\to 0} \frac{\sin h}{h\cos(x+h)\cos x}$$

$$= \lim_{h \to 0} \frac{\sin h}{h} \cdot \lim_{h \to 0} \frac{1}{\cos(x+h)\cos x}$$

$= 1. \sec^2 x$

$= \sec^2 x$

[17] Converse statement : If x is an integer and x is even, then x^2 is even.

[18] $\{H, TH, TTH, TTTH, \ldots\ldots\ldots\ldots\ldots\ldots\ldots.\}$, P (AUB) = 1, P(A') = 0.3 , $\frac{6}{36} = \frac{1}{6}$

Doublets are (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6)

n (Doublets) = 6. n (S) = 36. P (Doublets) = $\frac{6}{36} = \frac{1}{6}$

[19]

Class	Frequency	Mid point	$y_i = \frac{xi-65}{10}$	y_i^2	$f_i y_i$	$f_i y_i^2$
30 – 40	3	35	-3	9	-9	27
40 – 50	7	45	-2	4	-14	28
50 – 60	12	55	-1	1	-12	12
60 – 70	15	65	0	0	0	0
70 – 80	8	75	1	1	8	8
80 – 90	3	85	2	4	6	12
90 - 100	2	95	3	9	6	18
	50				-15	105

Mean = A + $\frac{\sum fi\, yi \;\, .\, h}{N}$ = 65 + $\frac{-15 \, x \, 10}{50}$ = 65 – 3 = 62

Variance, $\sigma^2 = \frac{h^2}{N^2}$ $[\, N \sum fi\, yi^2 - (\sum fi\, yi)^2 \,]$

$= \frac{100}{2500}$ [50. 105 – $(-15)^2$]

$= \frac{5025}{25}$

= 201

Standard Deviation, S.D = $\sqrt{201}$

= 14.18

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