PUBLIC EXAM MATHS FULL QUESTION PAPER ANSWER KEY-2019

ONE MARKS

	Type A	Type B
1)	4	4
2)	1	1
3)	4	4
4)	1	3
5)	4	3
6)	1	2
7)	2	4
8)	2	4
9)	4	2
10)	2	1
11)	1	4
12)	3	1
13)	3	4
14)	4	2
15)	1	3
16)	4	2
17)	2	3
18)	4	4
19)	1	3
20)	3	4

TWO MARKS

21) $x+y+z=100$, $1+2y+5z=30$

22) $3\vec{i} + 2\vec{j} + 9\vec{k} = a\ (\vec{i} + m\vec{j} + 3\vec{k})$

Equating component vectors a =3 , am=2 then m= 2/3

23) $(\frac{1+i}{1-i} x \frac{1+i}{1+i})$= 2i/2=I then $i^4 = 1$. ie n=4

24) only comet diagram

25) dy/dx= cosx

dy/dx=0 then cosx=0 → x=(2n+1)$\pi/2$. n∈ z.

26) Domain : $(-\infty, \infty)$

Extent : vertical : $(-\infty, \infty)$

Horizontal : $(-\infty, \infty)$

27) $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{tanx}} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan(\frac{\pi}{6}+\frac{\pi}{3}-x)}} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{\tan(\frac{\pi}{2}-x)}} = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{dx}{1+\sqrt{cotx}}$

28) closer axiom :

Let A= a/b ∈ $Q - 0$, B= -a/b ∈ $Q - 0$, then A+B =a/b-a/b=0 ∉ $Q - 0$

So its not closed.

29) Limits of integral is 0 to 3.

F(3) = $\int_0^3 3\, e^{-3x}\, dx = 3\, [\frac{e^{-3x}}{-3}]_0^{3} = -(e^{-9} - 1) = -e^{-9} + 1$

30) f(x) is not differentiable for x=2 and x=5 . so rolls theorem is not exists.

THREE MARKS

31) simply we take A= $\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$, B = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

A+B = $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ SO $\rho(A) = 3, \rho(B) = 3, \rho(A+B) = 0$

Hence $\rho(A) + \rho(B) \neq \rho(A+B)$

32) $\vec{a}x\vec{b} = \overrightarrow{-i} + 2\vec{j}\vec{+}2\vec{k}$ and $|\vec{a}x\vec{b}|$ =3 , $\mu = 6$

Required vector= $\mu(\pm\frac{\vec{a}x\vec{b}}{|\vec{a}x\vec{b}|})$=$\pm\ \overline{(-2\vec{i}} + 4\vec{j}\vec{+}24)$

33) let z= sinθ+i cosθ and $\bar{z}$=1/z= sinθ- i cosθ

$\frac{1+\sin\theta - i\cos\theta}{1+\sin\theta + i\cos\theta} = \frac{1+\bar{z}}{1+z} = \frac{1+\frac{1}{z}}{1+z}$ = 1/z= sinθ- i cosθ

Hence $\left[\frac{1+\sin\theta - i\cos\theta}{1+\sin\theta + i\cos\theta}\right]^n = (\sin\theta - i\cos\theta)^n = \cos n(\frac{\pi}{2} - \theta) - i\sin(\frac{\pi}{2} - \theta)$

34) Equation of tangent $x + yt^2 = 2ct$

A ,B coordinates are (2ct,0) and (2c/t,0) mid point of AB = $(\frac{2ct+0}{2}, \frac{0+\frac{2c}{t}}{2})$= (ct,c/t)

35) f(x)= $tan^{-1}(sinx + cosx)$, dy/dx = $\frac{cosx - sinx}{2+sin\,2x}$>0 in x∈ $(0, \pi/4)$

So f(x) is st.increasing in $(0, \pi/4)$

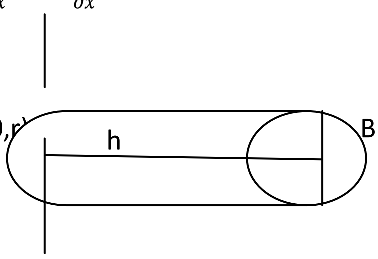
36) f(tx,ty) = $\frac{1}{\sqrt{(tx)^2+(ty)^2}} = \frac{1}{t\sqrt{x^2+y^2}} = t^{-1}$ f(x,y)

So f is Homogeneous fn.of deg -1

By eulers thm

$x\frac{\partial f}{\partial x} + y\,\frac{\partial f}{\partial x} = -1$

37) A(0,r) B(h,r)



Equation of the line AB is $\frac{y-r}{r-r}=\frac{x-0}{h-0}$

$\frac{y-r}{0}=\frac{x}{h}\rightarrow$ y-r =0 ie y=r

Volume of the cylinder $=\pi\int_0^h y^2\,dx$

$=\pi\int_0^h r^2 dx$

$=\pi\, r^2\,[x]_0^h=\pi\, r^2$h cu.unit

38)

p	q	$p\wedge q$	$p\vee q$	$(p\wedge q)\rightarrow(p\vee q)$
T	T	T	T	T
T	F	F	T	T
F	T	F	T	T
F	F	F	F	T

39) n=120

P=1/2 , q= 2/3

Mean = np= 120x1/3=40

Variance = npq= 40 x 2/3= 40/3

40) $yx^3dx=-e^{-x}dy$

$\frac{x^3dx}{e^{-x}}=-\frac{dy}{y}$

$\int e^x\,x^3dx=-\int\frac{dy}{y}$ using bernoullies integral formula

$e^x(x^3-3x^2+6x-6)$+ logy=c

FIVE MARKS

41) a) [A,B]= $\begin{bmatrix}1&1&3&0\\4&3&\mu&0\\2&1&2&0\end{bmatrix}$

$\sim\begin{bmatrix}1&1&3&0\\0&-1&\mu-12&0\\0&0&8-\mu&0\end{bmatrix}$

Case (i) if $\mu \neq 8$

$\rho(A) = \rho(A, B) = 3$

So it has trivial solution, (x,y,z)= (0,0,0)

Case (ii) if $\mu = 8$

$\rho(A) = \rho(A, B) = 2 < 3$

So it has non trivial solution , (x,y,z)= (c,-4c,c) ,where c$\neq 0$

b) diagram and correct proof

42) a) Cartesian equation

$$\begin{vmatrix} x - x_1 & y - y_1 & z - z_1 \\ x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ l & m & n \end{vmatrix} = 0$$

Ie 8x-10y-7z+11=0

b) $x^6(x^5 - 1) + 1\ (x^5 - 1) = 0$

$(x^5 - 1)(x^6 + 1) = 0 \rightarrow x^6 + 1 = 0\ and\ x^5 - 1 = 0$ ie $x^6 = -1\ and\ x^5 = 1$

Case(i) $x^6 = -1$

X = $(-1)^{\frac{1}{6}}$

= $(cis\pi)^{\frac{1}{6}}$

= $cis\pi(\frac{2k+1}{6})$, k=0,1,2,3,4,5

Case(ii) $x^5 = 1$

X = $1^{\frac{1}{5}}$

= $(ciso)^{\frac{1}{5}}$

= $(cis2k\pi)^{\frac{1}{5}}$

=cis$\frac{2k\pi}{5}$, k=0,1,2,3,4

43)a

w.k.t focal property of ellipse $F_1P + F_2P = 2a$

2a=9 and foci($\pm$ae,0)=($\pm$3,0) so ae=3 a=9/2, $b^2 = a^2 - (ae)^2$, $b^2 = 45/4$'

hence the required ellipse equation is

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ ie, $\frac{x^2}{\frac{81}{4}} + \frac{y^2}{\frac{45}{4}} = 1$

b) x= 2rcosθ, y=2r sinθ

area of tectangle = 2x.2y

A(θ) = 2rcosθ.2r sinθ

$\frac{d}{d\theta}$ A(θ) = $4r^2 cos2\theta$

$\frac{d}{d\theta}$ A(θ) =0 then $\theta = \pi/4$

$A''(\theta)$= -8$r^2 sin2\theta$<0 for $\theta = \pi/4$

So A is maximum for $\theta = \pi/4$

X=y= $\sqrt{2}$r,

Required area= x.y

=$\sqrt{2}$r. $\sqrt{2}$r

= $2r^2$

44) a

X= 100t-$\frac{25}{2}t^2$

(I) Initial velocity, so t=0

v= dx/dt=100 – (25/2) 2t

v= 100-0=100

ii)time taken. maximum height so v=0

ie 100-25t=0

t=4 sec

iii) maximum height reached when t=4 sec

x= 100(4)- (25/2)16

x = 200 mts

iv) velocity

if t= 4+ 4=8 sec

v= 100 – 25 (8)=-100 m/sec

b) equation

$$\frac{(y+1)^2}{16} - \frac{(x-1)^2}{9} = 1 \text{ ,} a^2\text{=16, } b^2 = 9$$

e=5/4

centre:(1,-1)

foci:(1,4), (1,-6)

vertices : (1,3), (1,-4)

45)a) P($z_1 < z < z_2$)= 70%

Ie P($z_1 < z < z_2$)= .70 ie P($z_1 < z < 0$)=.35 andp ($0 < z < z_2$)= .35

z_1 and z_2 lies left and right side of the normal curve

So $z_1 = -1.04$ and $z_2 = 1.04$

Z=$\frac{x-\mu}{\sigma}$=$\frac{x-34}{16}$=-1.04

X=17.36 and z=$\frac{x-34}{16}$= 1.04 → x=50.64

70% studend score b/w 17.36to 50.64

b) Y=sinx, y= cosx

Then sinx=cosx → x=$\frac{\pi}{4} \in (0, \pi)$

Required area = $\int_0^{\pi/4}(cosx - sinx)dx + \int_{\frac{\pi}{4}}^{\pi}(sinx - cosx)dx$

= $2\sqrt{2}$ sq.unit

46) a)

$\frac{dw}{dt}$ = $\frac{\partial w}{\partial x}\frac{dx}{dt}$+ $\frac{\partial w}{\partial y}\frac{dy}{dt} + \frac{\partial w}{\partial z}\frac{dz}{dt}$

= -sint+ 2cost+2t……….(1)

w= cost+2sint+t^2, $\frac{dw}{dt}$= -sint+ 2cost+2t……….(2)

hence proved

b) dT/dt= k(T-s), s=15

T= s+ce^{kt} ……….(1)

t=0 then T=100

(1) => c= 85

t = 5 , T=60 then $e^{5k} = \frac{45}{85}$

t =10 , then T= ?

T= 15+ 83 e^{10k}= 38.82

47) a

(i) Identity element of group is unique
(ii) Inverse of each element of group is unique
(iii) Reversal law
(iv) Cancellation law
(v) $[a^{-1}] - 1$=a

b) C.F = Ae^{2x}+ B$e^{-\frac{2}{5}x}$

P.I1= (-5/12) x$e^{-\frac{2}{5}x}$

P.I2 = (-2/7) e^{x}

P.I3 = -3/4

G.S y= C.F+ P.I1+P.I2+P.I3

= Ae^{2x}+ B$e^{-\frac{2}{5}x}$+(-5/12) x$e^{-\frac{2}{5}x}$+(-2/7) e^{x} -3/4

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