Sol 1 d -> dominant gene. r-> recessive gene.

dd-> purely dominent.

rr-> purely recessive. rd-> Hybrid.

NOTE: The purely dominant and hybrid individuals

Are A alike in appearance.

Children receive I gene from each parent.

With respect to perticular trait; 2 Hybrid Parents.

Have a total 4 children.

E: 43 out of 4 children have the outward appearance of the dominant gene.

O(E) = 9 Here it is given that both the parents are hybrid Parent 1- rd
Parent 2- rd. with probability!

So, their individual child will have the gene pur

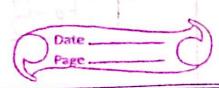
 $P(\Upsilon\Upsilon) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

 $P(Yd) = \left(\frac{1}{2} \times \frac{1}{2}\right) \times 2 = \frac{1}{2}$

 $P(JJ) = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

But in given event we need to find the probability of outward appearance of the dominant gene. In this case there can be 2 pairs possible.

—> rd ordd.



P(TY A YD) = P(12 A 12) = P(Y2) + P(12)

=
$$\frac{1}{4} + \frac{1}{2}$$

So here, $P(E) = \frac{4}{3} p^3 (1-p)^4$

$$= \frac{4}{3} \left(\frac{4}{3}\right) \left(\frac{3}{4}\right)^3 \left(\frac{1}{4}\right)$$

$$= \frac{27}{64}$$

p'= Probability that an individual component is conting properly. / component function. A communication system has n components. The system will be able to operate probperly. The total system will be able to operate effectively it at least half of its components. function.

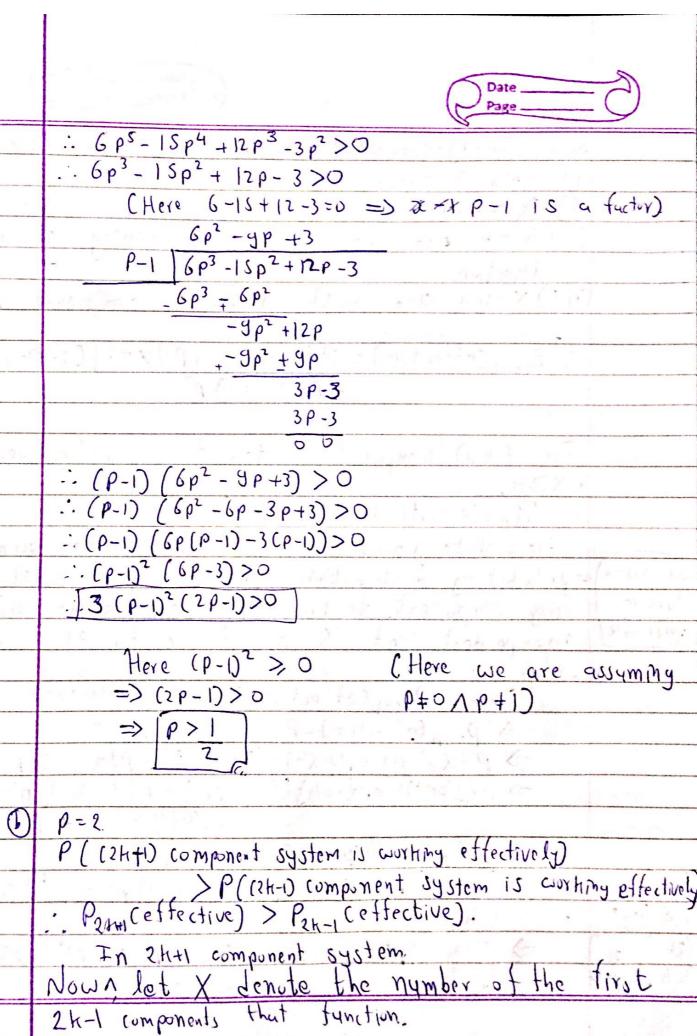
PCS-component system is working effectively)

P(3-components + system worth paper

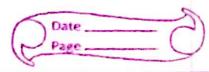
· P(S,P) > P(3,P)

 $-\frac{1}{3} \int_{3}^{3} (1-p)^{2} + \frac{5}{4} \int_{4}^{4} p^{4} (1-p)^{2} + p^{5} > \frac{3}{2} p^{2} (1-p) + p^{3}$

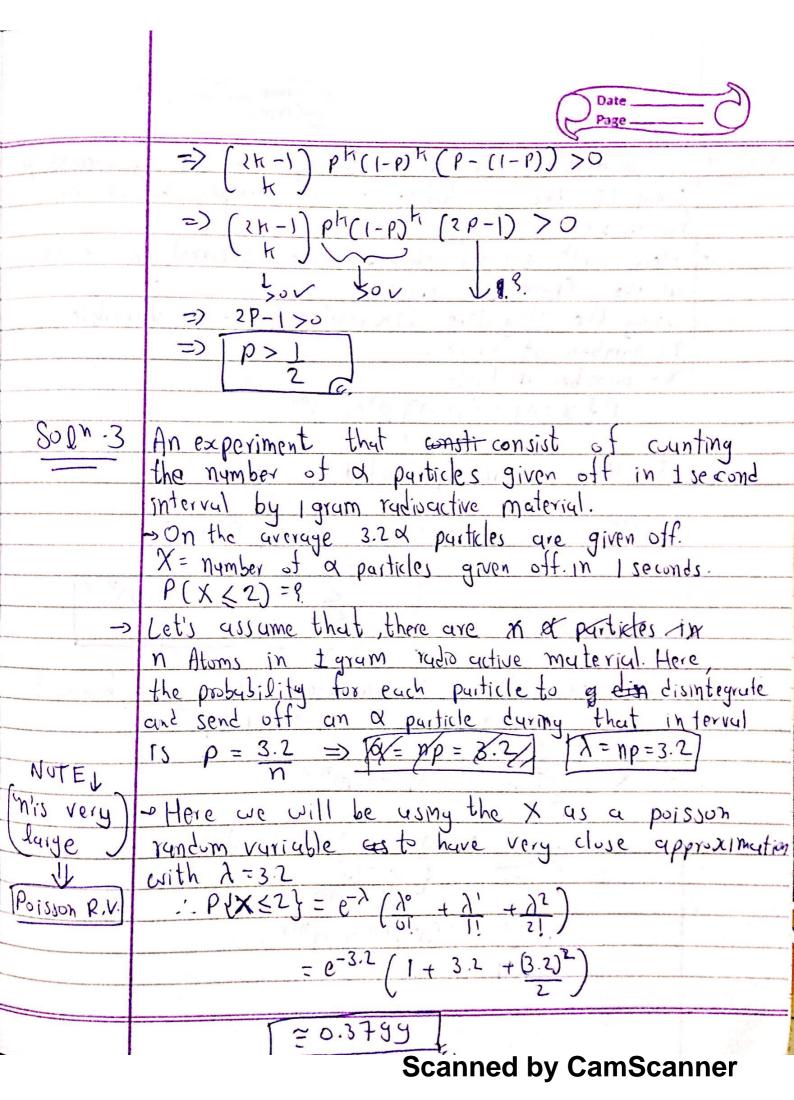
: $10p^{3}(1-2p+p^{2}) + 5p^{4}(1-p) + p^{5} > 3p^{2}(1-p) + p^{3}$: $10p^{5} - 20p^{4} + 10p^{3} + 5p^{4} - 5p^{5} + p^{5} > 3p^{2} - 3p^{3} + p^{3}$: $6p^{5} - 15p^{4} + 10p^{3} > 3p^{2} - 2p^{3}$

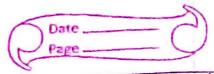


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Now (2K+1)-compunent system will be effective in this 3 cases (i) X> k+1; (11) X= k and one of the remaining 2 components function. (iii) X=H-1 and both next 2 component funition. [.] P2H+1 (effective) = P{X>h+1} +P{x=h}(1-(1-p)2) +P{X=h-1}p2 For (2h-1) component system to be effective · X>k. · [Pin- (effective) = P(X>K)] Here Note that we can use the same or same probability distribution as the probability for any component to function is the same and variable independent and X is define to the component Since Party Ceffective) > Party (effective) => P2H+1 (effective) - P2H+1 (effective) > 0 => P(X>H+1) + P(X=H)(1-(1-P)2) + P(X=H-1) p2-P(X>H)X0 => P(X>H+1) + P(X=H)(1-(1-P)2)+P(X=H-1) p2 -(P(xxh+1)+P(x>=h)>0. => $P\{x=k-1\}P^2 - P\{x=k\}(1-p^2)>0$ => $(2k-1)P^{k-1}(1-p)^kp^2 - (2k-1)P^k(1-p)^{k-1}(1-p)^2>0$ (Since => (2k-1)pk+1(1-p)k - (2k-1)pk(1+p)k+1>0 (2h-1)=(2h-1)





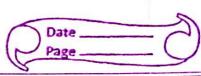
Solv-4 Independent trials with the probability of syccesser What is the probability of r syccesses before m Here rth success should have occurred before or at the (rtm-1) th trials.

Voing the Negative binomial random variable,

r= number of success

X= number of trials. tyilures? $P\{\chi=n\}=\binom{n-1}{r-1}p^{\gamma}(1-p)^{n-\gamma}.$ So, Here desired probability is P(r success before m failure) = & P(x=n)- $= \sum_{\lambda+m-1}^{N=\lambda} {\binom{\lambda-1}{N-1}} b_{\lambda} (1-b)_{\lambda-\lambda}$ Sul"-5) Expected value and variance of negative binsmill random variable with parameters rap • E[g(x)] = E[g(x)] p(x): $E[x^k] = \sum_{n=1}^{\infty} n^k \binom{n-1}{r-1} p^r (1-p)^{n-r}$ $= \frac{\gamma}{\rho} \underbrace{\sum_{n=\gamma}^{\infty} n^{k-1}}_{N-1} \underbrace{\frac{n}{\gamma} \binom{n-1}{\gamma-1}}_{r} e^{r+1} (1-\rho)^{n-\gamma}$ $= \frac{\gamma}{\rho} \underbrace{\sum_{n=\gamma}^{\infty} n^{k-1}}_{N-1} \underbrace{\binom{n}{\gamma}}_{r} e^{r+1} (1-\rho)^{n-\gamma}$

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Now patting
$$M = N + 1$$

$$F(x^k) = Y \xrightarrow{\Sigma} (m-1)^{k-1} (m-1) p^{k+1} (1-p)^{m-(k+1)}$$

$$= \frac{Y}{P} = E((y-1)^{k-1})$$

Here Y is negative bosonical random variable with parameters $Y + 1 \neq P$. Now patting $k = 1$

Now patting $X = k = 2$.

$$F(X^k) = Y = (Y - 1)$$

$$= Y = (Y + 1 - 1) = = (Y + 1$$

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