Unit 5 – NUMERICALS

1. *Binomial Distribution:* $P = \frac{N!}{x!(N-x)!} p^x (1-p)^{N-x} = {}^{N}C_x p^x (1\text{-}p)^{N\text{-}x}$

$$\bar{A} = Np, \quad \sigma = \sqrt{Np(1-p)}$$

2. *Poisson's Distribution:* $P(r) = \frac{e^{-\mu}\mu^r}{r!}$

3. *Normal Distribution* $P = \frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-1(x-\mu)^2}{2\ \sigma^2}}$

4. *Gaussian Distribution* $P = \frac{1}{\sqrt{2\pi}} e^{\frac{-1}{2}z^2}$

5. $JM = \frac{Jump\ height}{Push\ height}$

6. *Base distance* $x_B = \frac{Total\ distance}{(Last\ frame\ No.-1)^2} = \frac{x}{(F_L-1)^2}$

7. $Push\ Time = \frac{Jump\ time}{JM}$

8. $JH = \frac{Push\ Accelaration}{Jump\ Acceleration} = \frac{Push\ Accelaration}{Gravitational\ Acceleration}$

9. $Stop\ time = \frac{push\ time\ X\ stop\ distance}{push\ height}$

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1. The probability of a newly designed transistor will survive a given short circuit is ¾. Find the probability that 2 of the next 4 components tested will survive.
2. Assuming that the photons scattered in a photon scattering experiment follows Poisson's distribution law, and the number of photons scattered per minute in 10 trials is 5, 8, 3, 7, 9, 4, 2, 3, 5, 4, what will be the probability that exactly 4 photons are scattered per minute?
3. During thermionic emission process, the emission of electrons is observed to follow Poisson's distribution. If the average number of electrons emitted is 5 per second, what is the probability that
    a. Exactly 3 electrons are given off
    b. more than 3 electrons are given off
4. In an experiment, a GM counter is used to record the beta particles emitted per second by 1g of ^{90}Sr. If, on an average, 4 particles are emitted per second, what will be the probability that more than 2 beta particles will appear?
5. A box contains one blue and six pink balls. A ball is picked up from the box and is put back into the box. All the balls are mixed thoroughly in the box. Determine the probability of picking blue ball exactly 3 times.
6. A machine produces on an average 2% defective items. In a random sample of 60 items, determine the probability of there being 5 defectives.
7. Calculate the Gaussian distribution function for the given data x=4, $\boldsymbol{\mu}$=7 and $\boldsymbol{\sigma}$=5.
8. Calculate the base distance for a ball rolling down an inclined plane, given the total distance 1.75m for 5 frames.
9. Using odd rule multipliers, calculate the distance between frame 6 and 7 given the base distance 0.036m for a car which is executing slow-out motion.
10. How many frames exist in a sequence of animation which covers a total distance of 0.2m with base distance 0.05m?

11. The push height of a character jumping is 40cm and the jump magnification is 10. Calculate the push acceleration and jump height. (Given: Gravitational acceleration=10ms^{-2})
12. The jumping animation sequence consists of 6 frames with push height 0.5m and stop height 0.6m. Calculate the stop time if the animation is played at 30fps.
13. Consider a superman executing jump action with jump height 30m and push height 0.6m. Calculate the push time in seconds assuming jump time of 2s.