①

$$P(\eta = x) = \sum_{k \geq x} P(\xi = k)\, P(\eta = x \mid \xi = k) =$$

$$= \sum_{k \geq x} \frac{\lambda^k e^{-\lambda}}{k!} C_k^x\, p^x (1-p)^{k-x} =$$

$$= e^{-\lambda} \sum_{k \geq x} \frac{\lambda^k \cancel{k!}\, p^x (1-p)^{k-x}}{\cancel{k!}\, x!\,(k-x)!} = \boxed{i = k - x} \Rightarrow$$

$$= \frac{e^{-\lambda}}{x!} \sum_{i \geq 0} \frac{\lambda^{i+x} p^x (1-p)^i}{i!} =$$

$$= \frac{e^{-\lambda}}{x!} \sum_{i \geq 0} \frac{(\lambda p)^x (\lambda(1-p))^i}{i!} =$$

$$= \frac{e^{-\lambda}}{x!} (\lambda p)^x \sum_{i \geq 0} \frac{(\lambda(1-p))^i}{i!} =$$

$$= \frac{e^{-\lambda} (\lambda p)^x}{x!} e^{\lambda(1-p)} = \frac{(\lambda p)^x e^{-\lambda p}}{x!}$$

② $P(\text{kind} \mid T=10) = \dfrac{P(\text{kind}, T=10)}{P(T=10)} =$

$$= \frac{\cancel{\frac{1}{2}} \frac{1}{5\sqrt{2\pi}} \cdot \cancel{e^{-\frac{(10-20)^2}{2\cdot 5^2}}}}{\cancel{\frac{1}{2}} \frac{1}{5\cdot\sqrt{2\pi}}\, \cancel{e^{-\frac{(10-20)^2}{2\cdot 5^2}}} + \cancel{\frac{1}{2}} \cdot \frac{1}{10\cdot\sqrt{2\pi}}\, \cancel{e^{-\frac{(10-30)^2}{2\cdot 10^2}}}} =$$

$$= \frac{\frac{1}{5}}{\frac{1}{5}+\frac{1}{10}} = \frac{2}{3}$$