EE Qualifying Examination

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1. **A linear amplifier enhances the signal and noise powers by the same gain factor. In addition, amplifier internal noise is added to the output signal and so the signal-to-noise ratio is always degraded by linear amplification. Why is a linear amplifier used in optical communication systems?**

2. **A nonlinear regenerator reproduces a clean signal pulse from a distorted signal pulse. The signal-to-noise ratio of the output pulse is larger than that of the input pulse. However, there is a price we have to pay. What is the cost we have to pay for improving the signal-to-noise ratio in a nonlinear regenerator?**