

CSU11031 Sample Exam Paper 2021

Instructions

- There are 10 Multiple Choice Questions in this paper.
All questions carry equal marks – 10 marks each.
Answer **ALL** questions by entering A, B, C, D or E on the **Answer Sheet** provided.
- You have 3 hours to complete the paper and upload the **Answer Sheet**, your **worked solutions** and the **checked declaration** that this is your own work to Blackboard.
- If you have a registered disability then you have 3.5 hours to complete the examination
- If you have a registered disability please check the declaration to that effect.
- **You must upload your worked solutions with the Answer Sheet. Answers that are not accompanied with fully worked solutions will receive zero marks.**
- **Your solutions should be legible otherwise marks will not be awarded.**
- This is a 'Books-Open' exam. Use of the text(s) and notes is allowed.
- Use of non-programmable calculators is allowed.
- **ALL** documents submitted should be .pdfs

Please place an 'X' where appropriate:

I declare that my solutions for this exam are entirely my own work:

I declare that I have a disability that is registered with the college:

CSU11031 Exam Multiple Choice Answers

Please enter your answers (A – E)

Q 1 Answer:

Q2 Answer:

Q3 Answer:

Q 4 Answer:

Q 5 Answer:

Q 6 Answer:

Q 7 Answer:

Q 8 Answer:

Q 9 Answer:

Q 10 Answer:

Q1. A circuit consists of a dc source feeding three resistors in parallel that are in series with a single resistor. The resistance values of the parallel resistors are 5Ω , 20Ω , 15Ω respectively and the resistance value of the series resistor is 10Ω . If the power dissipated by the 10Ω resistor is $20W$ then what is, approximately, the current through the 5Ω resistor?

- A. $1.41mA$ B. $7.5mA$ C. $38mA$ D. $2.7mA$ E. N/A**

Q2. A dc supply of $10V$ supplies a capacitor of $10\mu F$ in series with a parallel combination of two capacitors of $6\mu F$ and $8\mu F$ respectively. What is the approximate charge on the $10\mu F$ capacitor?

- B. $113C$ B. $58.3\mu C$ C. $113\mu C$ D. $87mC$ E. N/A**

Q3. What is the approximate potential difference across two series inductors $250mH$ and $150mH$, if the current in the circuit has a peak to peak value of $15A$, a frequency of 50 Hz and the magnitude of the current at time $t=0$ is $7.5A$.

- A. $15 \sin\left(100t + \frac{\pi}{4}\right)V$ B. $-15 \sin\left(100\pi t + \frac{\pi}{2}\right)V$**
C. $7.5 \sin\left(200t + \frac{\pi}{4}\right)V$ D. $-0.943 \sin(100\pi t)V$
E. N/A

Q4. Consider a transistor-based amplifier circuit. What is the approximate maximum range of the output voltage?

- A. $0 \rightarrow V_{GS}$ B. $0 \rightarrow V_{DD}$ C. $V_G \rightarrow V_{DD}$ D. $V_G - V_{DS}$ E. N/A**

Q5. Consider a basic transistor-based inverter for use in a logic circuit. What is the primary purpose of the resistor at the drain?

- A. To drop the supply voltage when the transistor is fully switched on**
B. To provide amplification to the input signal
C. To protect the transistor from overheating
D. To limit the current to the output
E. N/A

Q6. A new digital high-definition phone system is being tested, able to capture voice frequencies up to 20KHz, and is being encoded using 16 bits per sample. The system can carry 24 such channels using Time Division Multiplexing. What is the total bit rate of the multiplexed system?

- A. 320Kb/s B. 40Kb/s C. 15.360Mb/s D. 24Mb/s E. N/A**

Q7. You need to design a system for the transmission of 20 Ultra High-Definition TV channels. Each video channel has a resolution of 3840 x 2160 pixels, a colour depth of 24 bits and a frame rate of 24 frames per second. In addition, each channel uses a compression algorithm to reduce its signal transmission rate by 75 times. Calculate the total bandwidth required if the 20 channels are multiplexed using Time Division Multiplexing, using a 64-QAM modulation.

- A. 1274Mb/s B. 2648MHz C. 414.6Mb/s D. 212.3 MHz E. N/A**

Q8. You need to design a communications system to support live transmission of 5 Ultra High Definition (UHD) channels, each having a pixel resolution of 3840 x 2160. The channels have a frame rate of 25 frames/sec and a colour depth of 24 bits. The audio track for each UHD channel is 5+1 surround (6 channels in total) with each encoded at CD quality (I.e. maximum audio frequency of 22.05KHz and quantisation at 16 bits per sample). Calculate the overall data rate of the system above with uncompressed UHD channels and all the audio tracks, assuming the channels are time division multiplexed.

- A. 24.86Mb/s B. 12.48Mb/s C. 12.48Gb/s D. 24.96Gb/s E. N/A**

Q9. You need to digitise a music recording for a high-fidelity system. The maximum audio frequency of the signal is 20KHz, the system is stereo, and you want to quantise it at 16 bits per sample. Calculate the bandwidth of the signal, if modulated at 1 MHz frequency using 32-QAM.

- A. 1024Mb/s B. 256KHz C. 1024MHz D. 24Gb/s E. N/A**

Q10. You need to design a communications system for transmitting Ultra High Definition (UHD) digital video channels, each with a pixel resolution of 3840 x 2160. Channels have a frame rate of 25 frames per second and a colour depth of 30 bits. The audio track for each channel is 7+1 surround (8 channels in total), each oversampled for a signal with maximum frequency of 96 KHz and quantisation at 20 bits per sample. What is the minimum carrier frequency that you would need to choose if you were to transmit the TV channel as is (including the audio tracks), with a 64-QAM modulation?

- A. 521MHz B. 1042MHz C. 260.5MHz D. 2.2Gb/s E. N/A**