BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI, RAJASTHAN
I SEMESTER (2017-18), Comprehensive Examination
ELECTRICAL SCIENCES (EEE F111)

A

Max. Time: 60 Min. **Date: 04/12/2017** **MM: 50**

SECTION-A (CLOSED BOOK)

NOTE: Write your answer in space provided. *OVERWRITTEN ANSWER WILL NOT BE RECHECKED*. EACH QUESTION IS OF TWO MARKS.

1. FET is a Voltage controlled device while BJT is Current controlled device.
2. A core, with effective length of 0.25 meter, cross sectional area is 0.002 m^2 and relative permeability 15000, has number of turns 25 wound on it. The value of inductance of the core is 0.0942 henry.
3. The switch has been closed for a long time as shown in Figure Q.3. The switch opens at t=0. The order of the system is Second and the response is underdamped (overdamped/underdamped/critically damped)

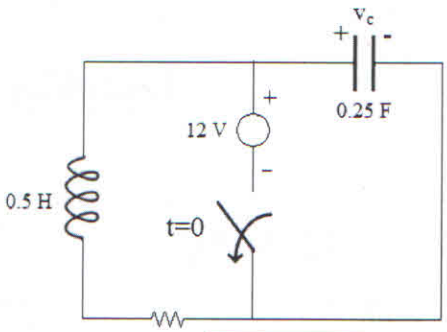


Figure Q.3

4. A source $V_s=120\angle 30^0$ V (rms) supplies current to a load Z=50+j80 Ω. The reactive power is 129.24 VAR (Also mention the units)
5. Amplitude response will be sharper for a RLC circuit having larger quality factor (large/small).
6. The value of load impedance will be R-jX for maximum power transfer, if impedance of source is (R+jX) ohms.
7. For 30° degrees rise in temperature, the reverse saturation current becomes 8 times the original reverse saturation current.
8. The ascending order of the size of (E:Emitter, B:Base, C:Collector) is Base, Emitter, Collector
9. In a common base mode, a PNP transistor has α = 0.988. The value of base current will be 0.0144mA if emitter current is 1.2 mA and negligible leakage current.
10. The minimum base current needed to make the transistor operate is saturation is 0.1mA. Given h_{fe}=100 and I_C=10mA.
11. JFET is always operated with the gate-source p-n junction R B. (Forward biased/ Reverse biased).
12. Thevenin's equivalent voltage is 11.2V and equivalent resistance is 0.8Ω in the circuit shown in figure Q.12 across load.

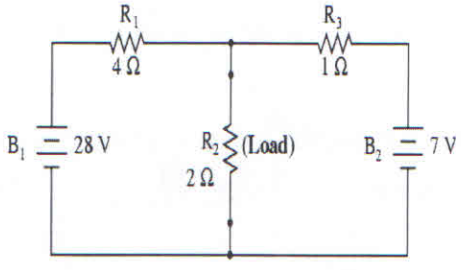
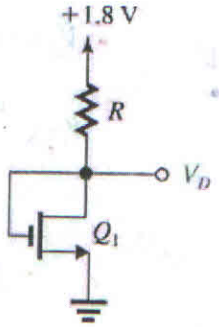


Figure Q.12.

P.T.O.

13. For the circuit in figure Q.13, the value of R that results in V_D =0.7 V is 34.4kΩ The MOSFET has V_t= 0.5 V and the fabrication parameter K is 0.8 mA/V^2.



a. Figure Q.13

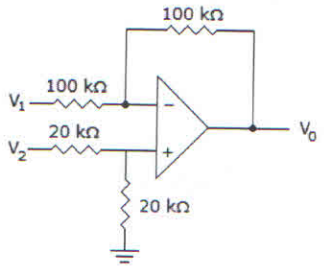


Figure Q.17

14. If an n-channel MOSFET conducts at V_{GS}=0V, it is called as depletion. (depletion/enhancement)
15. A DC battery of 12V is connected with a series RLC circuit of resistance 1 Ω, inductor 2 H and capacitor 5 μF, respectively. The voltage drop across the capacitor is 12 Volts.
16. The value of capacitor will be 38.44 micro farad, if magnitude of its capacitive reactance on 180 Hz is equal to magnitude of inductive reactance of a 0.061 henry inductor on 60 Hz.
17. For the ideal op-amp circuit in Figure Q.17, the output voltage when $V_1 = -V_2 = 1$ V is 2V.
18. The line current in star connection is equal to phase current. The statement is True (True/False).
19. In an ideal transformer, permeability of the core is infinite.
20. A transformer having 1000 primary turns and 4000 secondary turns has input current of 10 A in primary coil. The current in the secondary coil will be 2.5 A.
21. For an n-channel JFET operating in active region with $V_{GS} = 0.5\ V_P$, the ratio of I_D/I_{DSS} is 0.25. $I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)^2$
22. The mobility of electrons and holes in a sample of intrinsic germanium at room temperature is 0.36 m^2/V-s and 0.17 m^2/V-s respectively. The conductivity is 2.12 S/m, if electron and hole densities are each equal to 2.5 x 10^{19} /m^3.
23. If both the junctions are reverse biased in a p-n-p BJT then it is operating in cutoff region.
24. A 10 ohms resistor and a 2 henry inductor are connected in parallel, and ω = 50 rad/s. Quality factor of this combination is 0.1.
25. If coupling coefficient of a transformer is 0.8 and self-inductance of primary winding is four times the secondary winding, then mutual inductance is 1.6 H. Assume self-inductance of secondary winding is 1 H.

10/100

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B

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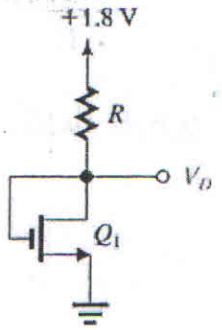
SECTION-A (CLOSED BOOK)

NOTE: Write your answer in space provided. *OVERWRITTEN ANSWER WILL NOT BE RECHECKED*. EACH QUESTION IS OF TWO MARKS.

1. For the circuit in figure Q1, the value of R that results in V_D =0.7 V is 34.4 kΩ. The MOSFET has V_t= 0.5 V and the fabrication parameter K is 0.8 mA/V^2.



a. Figure Q.1

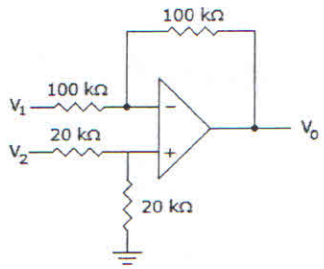


Figure Q.5

2. If an n-channel MOSFET conducts at V_{GS}=0V, it is called as depletion. (depletion/enhancement)
3. A DC battery of 12V is connected with a series RLC circuit of resistance 1 Ω, inductor 2 H and capacitor 5 μF, respectively. The voltage drop across the capacitor is 12V.
4. The value of capacitor will be 38.44 micro farad, if magnitude of its capacitive reactance on 180 Hz is equal to magnitude of inductive reactance of a 0.061 henry inductor on 60 Hz.
5. For the ideal op-amp circuit in Figure Q.5, the output voltage when $V_1 = -V_2 = 1$ V is 2V.
6. The line current in star connection is equal to phase current. The statement is True (True/False).
7. In an ideal transformer, permeability of the core is infinite.
8. A transformer having 1000 primary turns and 4000 secondary turns has input current of 10 A in primary coil. The current in the secondary coil will be 2.5 Amp.
9. For an n-channel JFET operating in active region with $V_{GS} = 0.5\ V_P$, the ratio of I_D/I_{DSS} is 0.25.
10. The mobility of electrons and holes in a sample of intrinsic germanium at room temperature is 0.36 m^2/V-s and 0.17 m^2/V-s respectively. The conductivity is 2.12 S/m, if electron and hole densities are each equal to 2.5 x 10^{19} /m^3.
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P.T.O.

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14. FET is a Voltage controlled device while BJT is Current controlled device.

15. A core, with effective length of 0.25 meter, cross sectional area is 0.002 m^2 and relative permeability 15000, has number of turns 25 wound on it. The value of inductance of the core is 0.0942 henry.

16. The switch has been closed for a long time as shown in figure Q.16. The switch opens at t=0. The order of the system is Second and the response is underdamped (overdamped/underdamped/critically damped)

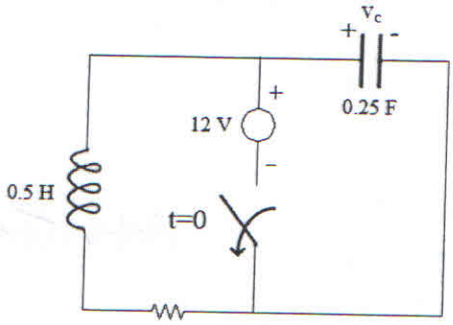

Figure Q.16

17. A source $V_s=120\angle 30^0$ V (rms) supplies current to a load Z=50+j80 Ω. The reactive power is 129.24 VAR (Also mention the units)

18. Amplitude response will be sharper for a RLC circuit having large quality factor (large/small).

19. The value of load impedance will be R−jX for maximum power transfer, if impedance of source is (R+jX) Ω.

20. For 30° degrees rise in temperature, the reverse saturation current becomes 8 times the original reverse saturation current.

21. The ascending order of the size of (E:Emitter, B:Base, C:Collector) is Base, Emitter, Collector.

22. In a common base mode, a PNP transistor has α = 0.988. The value of base current will be 0.0144 mA if emitter current is 1.2 mA and negligible leakage current.

23. The minimum base current needed to make the transistor operate is saturation is 0.1mA. Given h_{fe}=100 and I_C=10mA.

24. JFET is always operated with the gate-source p-n junction R. B. Forward biased/ Reverse biased).

25. Thevenin's equivalent voltage is 11.2V and equivalent resistance is 0.8Ω in the circuit shown in figure Q.25 across load.

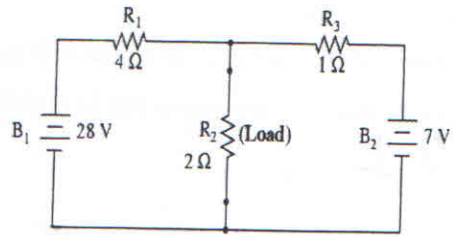

Figure Q.25

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