

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name: Applied Physics

Subject Code: 4TE02APH1

Branch: B.Tech(All)

Semester: 2

Date: 11/05/2016

Time: 10:30 To 1:30

Marks: 70

Instructions:

- (1) Use of Programmable calculator & any other electronic instrument is prohibited.
 - (2) Instructions written on main answer book are strictly to be obeyed.
 - (3) Draw neat diagrams and figures (if necessary) at right places.
 - (4) Assume suitable data if needed.
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Q-1

Attempt the following questions:

(14)

- a) Which type of impurity is added in intrinsic semiconductor to form an n-type semiconductor?
- b) Which are the majority and minority charge carriers in P-type semiconductor?
- c) In a diode circuit, the voltage drop across diode is $0.5 V$ in its on condition and current passing through diode is $2 mA$. Determine static resistance of the diode.
- d) Determine the forward voltage drop and forward resistance across an ideal diode.
- e) If the reverse bias voltage across diode increases, transition capacitance of a diode increases Determine whether given statement is true or false.
- f) Draw the symbol of photo diode and its characteristics.
- g) A half wave rectifier is supplied from $v_s = V_m \sin \omega t$, $50 Hz$ supply connected with a step down transformer. If V_m is the maximum voltage across the transformer secondary. Determine peak inverse voltage (PIV) across the diode.
- h) Draw the symbol of npn and pnp transistor and indicate various current directions.
- i) A transistor has a current gain (β) of 175. If the base current is $0.1 mA$, what is the collector current?
- j) A BJT is a current controlled device and JFET is also a current controlled device.



- Determine whether given statement is true or false.
- k) If a BJT is used for amplification purpose, the operating point (Q-point) of BJT must be adjusted in _____ region of the output characteristics.
 - l) Draw the symbol of n-channel depletion type MOSFET and n-channel enhancement type MOSFET.
 - m) List the characteristics of laser.
 - n) Give any four advantages of fiber optic communication.

Attempt any four questions from Q-2 to Q-8

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|------------|---|-------------|
| Q-2 | Attempt all questions | (14) |
| (a) | Explain the formation of N- type semiconductors. Draw its energy band diagram. | 07 |
| (b) | Discuss the process of avalanche breakdown and zener breakdown with the help of p-n junction theory. | 07 |
| Q-3 | Attempt all questions | (14) |
| (a) | The voltage across a silicon diode at room temperature of $310^{\circ} K$ is $0.68 V$, when $2.2 mA$ current flows through it. If the voltage is increased to $0.72 V$, calculate the diode current at room temperature. Consider ideality factor $\eta = 2$, Boltzman constant $k = 1.38 \times 10^{-23} J/^{\circ}K$. | 07 |
| (b) | Classify the materials based on energy band theory. Draw the energy band diagram for each material. | 07 |
| Q-4 | Attempt all questions | (14) |
| (a) | Draw the circuit diagram and waveforms for full wave center tap rectifier and explain its operation. | 07 |
| (b) | Draw the circuit diagram and waveforms for below circuits. | 07 |
| | i) Parallel Positive Clipper Circuit | |
| | ii) Series Negative Clipper Circuit | |
| Q-5 | Attempt all questions | (14) |
| (a) | Explain the voltage divider biasing technique for BJT. | 07 |
| (b) | A half wave rectifier circuit is supplied from a $110 V, 50 Hz$ supply with a step down ratio of $3:1$ to a resistive load of $1 k\Omega$. The diode forward resistance | 07 |



is 50Ω , while transformer secondary resistance is 15Ω . Calculate,

- i) Maximum value of load current
- ii) Average value of load current
- iii) RMS value of load current
- iv) DC output power
- v) Rectifier efficiency

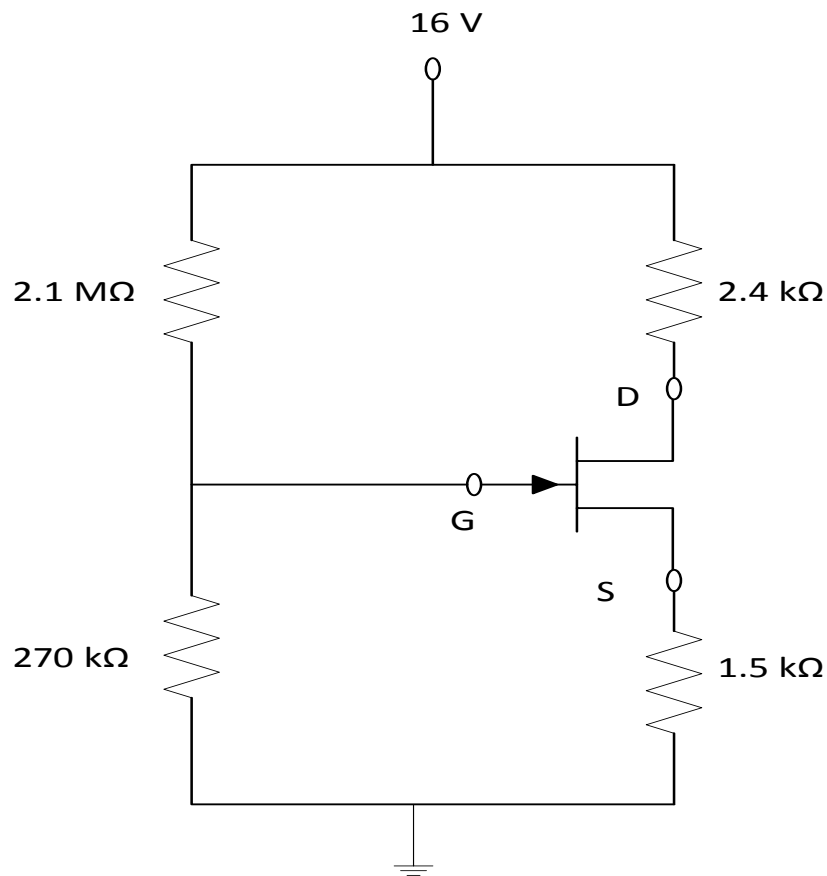
Q-6

Attempt all questions

(14)

- (a) Draw the circuit of common emitter configuration for BJT. Draw its input and output characteristics and only explain regions of output characteristics. **07**
- (b) Determine the following parameters for the below network. **07**

- i) I_{DQ} and V_{GSQ}
- ii) V_{DS}



Q-7

Attempt all questions

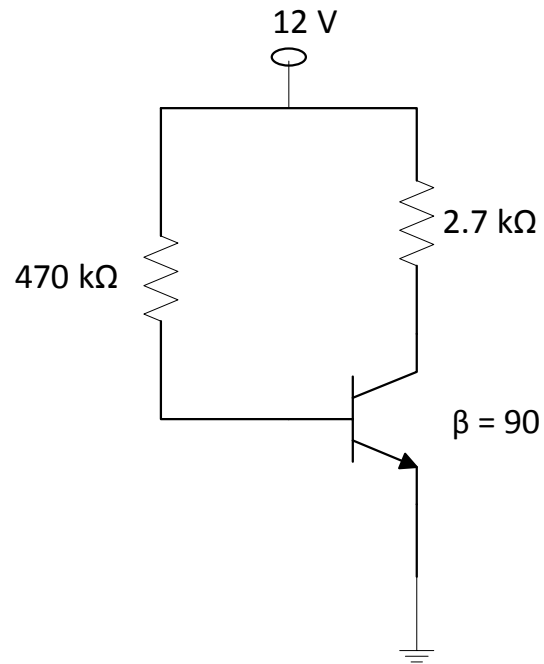
(14)



(a) Draw the construction of n-channel depletion type MOSFET and explain its 07

operation. Draw its V-I characteristics and transfer characteristics.

(b) Determine the value of I_B , I_C and V_{CE} for $\beta = 90$ for the below circuit. 07



Q-8 **Attempt all questions** **(14)**

(a) Compare spontaneous emission and stimulated emission for LASER. 07

(b) Explain various types of optical fiber configuration. 07

