



JX-003-1015027 Seat No. _____

B. Sc. (Sem. V) (CBCS) Examination

October – 2019

Physics - 503

(Solid State Electronics)

Faculty Code : 003

Subject Code : 1015027

Time : $2\frac{1}{2}$ Hours]

[Total Marks : 70

Instructions :

- (1) All questions are compulsory.
- (2) Symbols have their usual meanings.
- (3) Figures to the right indicate marks.
- (4) Non-programmable scientific calculator is allowed.

1 (A) Answer the following in short : 4

- (1) Power gain of 100 = _____ dB.
- (2) The reactance of a capacitor for DC is _____.
- (3) A power transistor has comparatively _____ β .
- (4) The push-pull amplifier circuit must use _____ operation.

(B) Solve the numerical : (Any One) 2

- (1) A transformer coupling is used in the final stage of a multistage amplifier. If the output impedance of transistor is $1\text{ k}\Omega$ and the speaker has a resistance of $10\ \Omega$, find the turn ratio of the transformer so that the maximum power is transferred to the load.
- (2) In a class-A transformer coupled power amplifier, $i_{c(\max)} = 160\text{ mA}$, $i_{c(\min)} = 10\text{ mA}$, $V_{ce(\max)} = 12\text{ V}$ and $V_{ce(\min)} = 2\text{ V}$. Calculate the a.c. output power.

(C) Answer in brief : (Any One) 3

- (1) How will you achieve impedance matching with transformer coupling ?
- (2) Explain thermal runaway in brief.

- (D) Answer in detail : (Any One) 5
- (1) Explain transformer coupled amplifier and its frequency response with neat diagrams.
 - (2) Explain push-pull amplifier and write its advantages and disadvantages.
- 2 (A) Answer the following in short : 4
- (1) A bistable multivibrator is also known as _____.
 - (2) When a sine wave is applied to a differentiating circuit, it behaves as _____.
 - (3) A clipping circuit is also known as _____.
 - (4) A clamping circuit adds _____ component to the signal.
- (B) Solve the numerical : (Any One) 2
- (1) What will be the amplitude of output wave form of a symmetrical zener clipper having $V_z = 4.3$ volt if when the circuit is applied with input having amplitude ± 10 volts.
 - (2) A differentiating circuit containing $5\text{ k}\Omega$ resistance and $47\text{ }\mu\text{F}$ capacitor is applied with an input that varies from 0 to 12 V with constant rate 0.4 sec, determine the output voltage.
- (C) Answer in brief : (Any One) 3
- (1) Give the basic difference among the three multivibrator.
 - (2) Show that the output of an integrating circuit is proportional to the integral of the input.
- (D) Answer in detail : (Any One) 5
- (1) Draw the neat diagram of a bistable multivibrator and explain its working.
 - (2) What is a clipper circuit ? Explain the working of a positive clipper with and without bias applied.

- 3 (A) Answer the following in short : 4
- (1) A Zener diode having power rating of 0.5 watt is used as a voltage regulation with the Allowed maximum zener current of 50 mA. What will be the zener voltage V_Z ?
 - (2) The percentage voltage regulation of an ideal voltage regulator is _____.
 - (3) The bandwidth of an ideal Op-Amp is _____.
 - (4) The Op-Amp inverting amplifier is also known as _____.
- (B) Solve the numerical : (Any One) 2
- (1) A power supply having open circuit DC output is 400 V when connected for full load the output decreases to 300 V, find the percentage of regulation.
 - (2) Find the output voltage of an Op-Amp subtractor circuit if $R_1 = 10 \text{ k}\Omega$, $R_f = 100 \text{ k}\Omega$, $V_1 = 5 \text{ V}$ and $V_2 = 6\text{V}$.
- (C) Answer in brief : (Any One) 3
- (1) Explain transistor shunt voltage regulator.
 - (2) Explain Op-Amp as an unity follower.
- (D) Answer in detail : (Any One) 5
- (1) Write a short note on regulated power supply.
 - (2) With the help of necessary circuit diagram, show how an Op-Amp can be used as an integrator. Derive the necessary expression.
- 4 (A) Answer the following in short : 4
- (1) LVDT is a _____ inductive transducer.
 - (2) A strain gauge is a _____ transducer.
 - (3) Semiconducting materials can be used to fabricate NTC type thermistors. True OR false ?
 - (4) Write the equation of gauge factor.
- (B) Solve the numerical : (Any One) 2
- (1) If the total resistance of a resistive element of a resistive position transducer is $R_{AC} = 100 \text{ k}\Omega$, $R_{BC} = 20 \text{ k}\Omega$ is applied with 24 V, find the output voltage.

- (2) The resistance of a thermistor at room temperature is $222\text{ k}\Omega$ is when applied with 5 volt at $50\text{ }^\circ\text{C}$ produces a current of $30\text{ }\mu\text{A}$, what will be the resistance of thermistor at this temperature?
- (C) Answer in brief : (Any One) 3
- (1) Explain capacitive pressure transducer.
 (2) Explain resistance temperature detector.
- (D) Answer in detail : (Any One) 5
- (1) Write a detailed short note on tachometer.
 (2) Write a short note on Thermocouples.
- 5 (A) Answer the following in short : 4
- (1) The deflection type instruments with a scale and movable pointer are called
- (2) The CRO provides a two dimensional visual display of the signal wave shape on the screen. True OR False
- (3) The sensitivity of an instrument with full wave rectifier through AC is _____ times of the DC.
- (4) Flip-Flops can be used as a _____ device in a computer.
- (B) Solve the numerical : (Any One) 2
- (1) A 555 timer astable multivibrator having $R_A = 10\text{ k}\Omega$, $R_B = 4.7\text{ k}\Omega$ and $C = 1\text{ }\mu\text{F}$. Find the positive pulse width, negative pulse width and duty cycle.
- (2) Find the value of capacitor required to generate a 15 ms pulse width for the 555 timer monostable multivibrator having $R_A = 100\text{ k}\Omega$.
- (C) Answer in brief : (Any One) 3
- (1) Explain digital voltmeter.
 (2) Draw the circuit diagram of a Half adder and explain it using truth table.
- (D) Answer in detail : (Any One) 5
- (1) Describe the construction and working of rectifier type AC meters.
 (2) Write a note on J-K flip-flop.