DF-2988
Second Year B. Sc. (CBCS) (Sem. III) Examination
March / April - 2016
Physics : Paper - V

Time : 2 Hours] [Total Marks : 50

(1) Fill up strictly the details of signs on your answer book.

(2) Non-programmable scientific calculator can be used.

(3) Notations used in the question paper are as usual meaning.

Q. 1 to 12 Multiple Choice Questions are each of 1 Mark
Q. 13 to 22 Multiple Choice Questions are each of 2 Marks
Q. 23 to 28 Multiple Choice Questions are each of 3 Marks

O.M.R. Sheet बरेच अंशाचे अनेक-च्या सूचनासाठी उपयोग करा.
O.M.R. Sheet-विच पात्र आपेक्षिक.

Important instructions to fill up O.M.R. Sheet are given on back side of the provided O.M.R. Sheet.

DF-2988_B ] 1 [ Contd...
The true mathematical relation between Thevenin resistance $R_{TH}$ & Norton's resistance $R_N$ is ________.

(A) none of these

(B) $R_{TH} < R_N$

(C) $R_{TH} = R_{TN}$

(D) $R_{TH} > R_N$

Thevenin voltage of a circuit equals ________.

(A) Load voltage

(B) Short-terminal voltage

(C) EMF of the battery

(D) Open circuit terminal voltage
3 The disadvantage of voltage divider bias is that it has ________.

(A) None of these
(B) high stability factor
(C) low base current
(D) many resistors

4 A JFET is similar in operation to ________ valve.

(A) tetrode
(B) diode
(C) pentode
(D) triode
5. If the temperature increases, the value of $V_{BE}$ ________.

(A) None of these

(B) remains the same

(C) is increased

(D) is decreased

6. In one A.C. network current becomes zero 120 times in one second, then what is the frequency of A.C. current?

(A) 60 Hz

(B) 120 Hz

(C) 1 Hz

(D) 200 Hz
7. Which one of the circuits in Fig. 1 is balanced?

(A) Amplifier

(B) Oscillator

(C) Rectifier

(D) Diode

When A.C. bridge is balanced, current flowing through detector is ____ A.

(A) None of these

(B) Infinity

(C) Zero

(D) 1

8. In an L–C–R series network, the voltage difference across the two terminals of L, C & R are $V_L$, $V_C$ & $V_R$ respectively, then the voltage of A.C. source is ______.

(A) $\sqrt{V_R^2 + (V_L + V_C)^2}$

(B) $V_L + V_R - V_C$

(C) $V_L - V_R + V_C$

(D) $V_L + V_C + V_R$
9 Generally, ________ is used to measure unknown inductance in terms of resistance & a standard fixed capacitor.

(A) none of these
(B) Anderson's bridge
(C) Owen's bridge
(D) Maxwell's bridge

10 In parallel resonant circuit, at resonance the impedance of the circuit is ________.

(A) none of these
(B) infinity
(C) zero
(D) one
The circuit in which currents of unwanted frequencies are not allowed to pass is ________.

(A) filter

(B) parallel resonant circuit

(C) acceptor

(D) series resonance circuit

The condition for stiff voltage source is ________.

(A) $R_s < 0.01 \, R_L$

(B) $R_s = 0.01 \, R_L$

(C) $R_s = 0.001 \, R_L$

(D) $R_s > 0.01 \, R_L$
For given circuit find $V_{TH}$ & $R_{TH}$.

(A) None of these
(B) 24V, 5.33 kΩ
(C) 12V, 5.33 kΩ
(D) 24V, 6 kΩ

By using biasing with collector feedback method, a transistor in CE configuration the operating point is set at (2V, 1mA). If $\beta=100$ and $V_{BE}=0.7$ V then $R_B=$ ________.
15 In CE germanium transistor VDB circuit, $\alpha = 0.985$, $V_{CC} = 16$ V, $R_2 = 20k\Omega$, $R_E = 2k\Omega$ and operating point is $(2V, 1mA)$. Give the value of Voltage across $R_2$.

(A) None of these
(B) 4.3 V
(C) 4 V
(D) 11.7 V

16 JFET ने $I_{DSS} = 12$ mA, $V_{GS} = -4V$ and $V_{GSOFF} = -5V$ तो $I_D = \underline{\hspace{2cm}}$.

JFET has $I_{DSS} = 12$ mA, $V_{GS} = -4V$ & $V_{GSOFF} = -5V$ then $I_D = \underline{\hspace{2cm}}$.

(A) None of these
(B) 0.48 mA
(C) 0.24 mA
(D) 17 mA
17. For the given JFET biasing circuit, \( V_{DD} = 10\, V \), \( V_{EE} = 5\, V \), \( R_D = 1\, k\Omega \), \( R_G = 1M\Omega \), \( V_{BE} = 0.7\, V \) & \( R_E = 2\, k\Omega \), the drain voltage is ________.

In a current source bias JFET circuit, \( V_{DD} = 10\, V \), \( V_{EE} = 5\, V \), \( R_D = 1\, k\Omega \), \( R_G = 1M\Omega \), \( V_{BE} = 0.7\, V \) & \( R_E = 2\, k\Omega \), then the drain voltage is ________.

(A) 5 V  
(B) 4.3 V  
(C) 7.85 V  
(D) 15 V

18. For the given L–C–R circuit, \( V = 100\, \text{volts} \), \( R = 1\, \Omega \), \( L = 1\, \text{H} \) & \( C = 7.04\, \mu\text{F} \), what is the maximum current in the circuit?

In a series L–C–R circuit, \( V = 100\, \text{volts} \), \( R = 1\, \Omega \), \( L = 1\, \text{H} \) & \( C = 7.04\, \mu\text{F} \). Then what will be the maximum current in the circuit?

(A) 10 mA  
(B) 10 A  
(C) 100 A  
(D) 10 \mu A
In one L–C–R circuit L & R are connected in series and C is connected in parallel with combination. If L = 1 H, C = 10 μF, R = 100 Ω & A.C. supply is of 220V 50Hz Then the impedance is maximum for ω = ________ rad/sec.

(A) None of these

(B) 316

(C) 300

(D) 157

In a series resonant circuit L = 0.2 H, R = 10 Ω & C = 10 μF are connected with A.C. supply of 200V, 50Hz. The impedance of circuit ________.

(A) 255 Ω

(B) 32.6 Ω

(C) 390 Ω

(D) 380 Ω
C = 12.5 \mu F ना कैपेशिटरने 60 Hz आवृत्ति माले अवधार __________.

The capacitive reactance of $C = 12.5\mu F$ with $f = 60$ Hz is __________.

(A) 4650\Omega

(B) 4.71\text{m}\Omega

(C) 121\Omega

(D) 212\Omega

22 एक वैकल्पिक ब्रिजनी AB शाखानं 45\Omega ना अवरोधनु अखात प्रेरणा $L_1$ सापे श्रेणीमां, BC शाखामं 290\Omega नो अवरोध, CD शाखामं 0.8\mu F ना कैपेशिटर ने 580\Omega ना अवरोध सापे सामान्यमां, AD शाखामं 90\Omega नो अवरोध जाणारे B अने D वर्गे प्रीटेक्टर जोडेले छ तथा A अने C वर्गे अ.सी. लक्षाम जोडेले छ, तो ब्रिज संगणना व पप्प मे $L_1 = $ __________.

In a Maxwell bridge a resistance of 45\Omega is connected in series with unknown inductance $L_1$ in branch AB, resistance 290\Omega is connected in branch BC, in branch CD there is a parallel combination of capacitor & resistance of values 0.8\mu F & 580\Omega respectively. In branch AD there is resistance of 90\Omega and a detector is connected between B & D. Also A.C. voltage source is connected between A & C. Find $L_1$ when bridge is balanced.

(A) 12 H

(B) 21 mH

(C) 12 mH

(D) 11 mH
The four arms of Wien's bridge ABCD are made up by following data values:

AB branch have 200Ω resistance in parallel with 1μF capacitor, BC branch has 400Ω resistance, CD branch has 1000Ω resistance, AD branch has a resistance R in series with a 2μF capacitor. An A.C. source is connected between point A & C and detector is connected between point B & D. Find the value of R & frequency when bridge is balanced.

(A) 100Ω & 96 Hz
(B) 400Ω & 796 Hz
(C) 200Ω & 960 Hz
(D) 100Ω & 796 Hz

In a series LCR circuit, when a voltage of 400 cos (3000 t − 10°)V is applied, the current flowing is 10√2 cos (3000 t − 55°) amperes. If L = 0.01H then what are the values of R & C ?

(A) 30Ω, 33.3μF
(B) 30Ω, 3.33μF
(C) 28Ω, 3.33μF
(D) 20Ω, 33.3μF
25  In a VDB CE (Si) transistor circuit, $V_{CC} = 15 \text{ V}$, $R_1 = 10 \text{ k}\Omega$, $R_2 = 2.2 \text{ k}\Omega$, $R_E = 1 \text{ k}\Omega$, $V_{BE} = 0.7 \text{ V}$, $R_C = 3.6 \text{ k}\Omega$ and $\beta_{dc} = 200$, then $V_{CE} =$ ________ and $I_E =$ ________.

(A) 11.07 V, 2 A  
(B) 11.07 V, 1 A  
(C) 5.8 V, 2 mA  
(D) 11.07 V, 2 mA

26  In a stiff VDB circuit, $V_{CE} = 10 \text{ V}$, $V_{CE} =$ ________, $I_C = 1 \text{ mA}$ and $\beta_{dc} = 70$ to 200, $V_{BE} = 0.7 \text{ V}$ at mid point: $R_1 =$ ________, $R_2 =$ ________ and $R_E =$ ________.

Using stiff VDB design guidelines & given data values: $V_{CC} = 10 \text{ V}$, $V_{CE}$ is at mid point, $I_C = 1 \text{ mA}$ and $\beta_{dc} = 70$ to 200, $V_{BE} = 0.7 \text{ V}$ the values of $R_1 =$ ________, $R_2 =$ ________ and $R_E =$ ________.

(A) 342 $\Omega$, 200 $\Omega$, 150 $\Omega$  
(B) 13.67 $\Omega$, 280 $\Omega$, 100 $\Omega$  
(C) 13.67 $k \Omega$, 2.8 $k \Omega$, 1 $k \Omega$  
(D) 13.67 $k \Omega$, 280 $\Omega$, 1 $k \Omega$
27. A JFET has \( I_{DSS} = 35 \text{ mA}, \ V_p = 12 \text{ V} \) & \( g_{m0} = 5100 \mu \text{S} \) तथा, ते \( V_{GS} = -6 \text{ V} \) माणे \( I_D \) ते \( g_m \) नसे मुद्दे ________.

A JFET has \( I_{DSS} = 35 \text{ mA}, \ V_p = 12 \text{ V} \) & \( g_{m0} = 5100 \mu \text{S} \). For \( V_{GS} = -6 \text{ V} \) the values of \( I_D \) & \( g_m \) are ________.

(A) None of these
(B) 8.75 mA, 255 \( \mu \text{S} \)
(C) 8.75 mA, 2550 \( \mu \text{S} \)
(D) 7.5 mA, 255 \( \mu \text{S} \)

28. A bridge network ABCD नीवे सूचित बनावले हे. बिंदुओ A अने B, B अने C, C अने D, A अने D तत्क. B अने D व्याख्या अनुसार \( 10 \Omega, 30 \Omega, 15 \Omega, 20 \Omega, \) अने \( 40 \Omega \), नाही अवरोध आणेला हे. बिंदुओ A अने C व्याख्या अवरोध आंतरिक अनेक घनांकले \( 2 \text{ V} \) नी दी. व्यवस्था तोटा हे. आ परिपथ माणे \( V_{TH} \), \( R_{TH} \) तथा BD शाखांमधील वर्गे प्रवाह ________.

A bridge network ABCD is arranged as follows: Resistance between terminals A & B, B & C, C & D, D & A and B & D are \( 10 \Omega, 30 \Omega, 15 \Omega, 20 \Omega, \) & \( 40 \Omega \), respectively. A 2 V d.c battery of negligible internal resistance is connected between terminals A & C. For this circuit the values of \( V_{TH} \), \( R_{TH} \) & current through BD branch are ________.

(A) None of these
(B) 1.5 V, 18 \( \Omega \), 20A
(C) 0.86 V, 16.6 \( \Omega \), 11.5A
(D) 0.645 V, 16 \( \Omega \), 11.5 mA