DU MTech Microwave Electronics

Topic:- ME MTECH

1) Using Newton- Raphson method, a root correct to three decimal places of the equation is $x^3 - 3x - 5 = 0$

[Question ID = 10688]

1. 2.275

   [Option ID = 42749]
2. 2.279

   [Option ID = 42750]
3. 2.222

   [Option ID = 42751]
4. None of the above

   [Option ID = 42752]

2) An eigen vector of P= $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 2 \\ 0 & 0 & 3 \end{bmatrix}$ is

[Question ID = 10689]

1. $[1 \quad 2 \quad 1]^T$

   [Option ID = 42753]
2. $[-1 \quad 1 \quad 1]^T$

   [Option ID = 42754]
3. $[1 \quad -1 \quad 2]^T$

   [Option ID = 42755]
4. $[2 \quad 1 \quad -1]^T$

   [Option ID = 42756]

3) The solution of $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 17y = 0; y(0) = 1, \frac{dy}{dx}\left(\frac{\pi}{4}\right) = 0$ in the range $0 < x < \frac{\pi}{4}$ is given by

[Question ID = 10690]

1. $e^x\left(\cos 4x - \frac{1}{4}\sin 4x\right)$

   [Option ID = 42757]
2. $e^{-4x}\left(\cos x - \frac{1}{4}\sin x\right)$

   [Option ID = 42758]
3. $e^{-4x}\left(\cos 4x - \frac{1}{4}\sin 4x\right)$

   [Option ID = 42759]
4. $e^{-x}\left(\cos 4x + \frac{1}{4}\sin 4x\right)$

   [Option ID = 42760]

4) $\lim_{x \to 0} \frac{cos\ x - 1}{x^2} =$

[Question ID = 10691]

1. -1

   [Option ID = 42761]
2. $1/2$

   [Option ID = 42762]
3. 1

   [Option ID = 42763]
4. $-1/2$

[Option ID = 42764]

5) The value of given definite integral $\int_0^1 log\left(\frac{1}{x}-1\right)dx$

is

[Question ID = 10692]

1. 1

   [Option ID = 42765]
2. 0

   [Option ID = 42766]
3. infinity

   [Option ID = 42767]
4. -1

   [Option ID = 42768]

6) The equation of the plane through the points $(1,-2,3)$, $(1,2,-3)$ and $(-1,2,3)$ is

[Question ID = 10693]

1. $5x+3y+2z-5=0$

   [Option ID = 42769]
2. $6x+3y+2z-6=0$

   [Option ID = 42770]
3. $7x-y+2z-2=0$

   [Option ID = 42771]
4. $12x+3y-2z-6=0$

   [Option ID = 42772]

7) The partial differentiation equation $\frac{\delta y}{\delta x}(xy)=5\frac{\delta^2 z}{\delta y^2}$ can be classified as

[Question ID = 10694]

1. Elliptic

   [Option ID = 42773]
2. Parabolic

   [Option ID = 42774]
3. Hyperbolic

   [Option ID = 42775]
4. None of the above

   [Option ID = 42776]

8) If $f(x)=\cos x^x$ then $\frac{df}{dx}=$ _____

[Question ID = 10695]

1. $x^x \sin x^x(1+logx)$

   [Option ID = 42777]
2. $-x^x \sin x^x(logx)$

   [Option ID = 42778]
3. $x^x \sin x^x(logx)$

   [Option ID = 42779]
4. $-x^x \sin x^x(1+logx)$

   [Option ID = 42780]

9) Let, $A=\begin{bmatrix}2 & -0.1\\ 0 & 3\end{bmatrix}$ and $A^{-1}=\begin{bmatrix}1/2 & a\\ 0 & b\end{bmatrix}$ then $(a+b)=$

[Question ID = 10696]

1. $11/20$

[Option ID = 42781]

2. $7/20$

[Option ID = 42782]

3. $3/20$

[Option ID = 42783]

4. $19/20$

[Option ID = 42784]

10) Match List I with List II

List I	List II
Quantities	Units
A. R/L	I. Second
B. 1/LC	II. Ohm
C. RC	III. $(\text{Radian/Second})^2$
D. $\sqrt{L/C}$	IV. $(\text{Second})^{-1}$

Choose the correct answer from the options given below:

[Question ID = 10697]

1. A - IV, B - III, C - I, D - II

[Option ID = 42785]

2. A - III, B - IV, C - II, D - I

[Option ID = 42786]

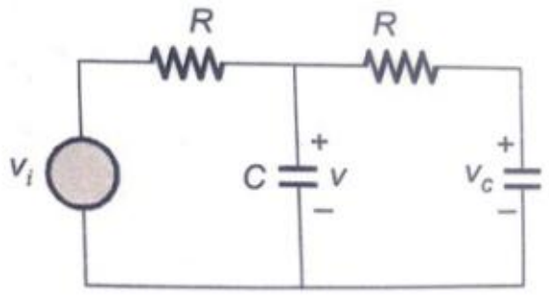
3. A - IV, B - III, C - II, D - I

[Option ID = 42787]

4. A - III, B - IV, C - I, D - II

[Option ID = 42788]

11) For the circuit given below, what is the expression for the voltage V?



[Question ID = 10698]

1. $V + V_c$

[Option ID = 42789]

2. V_c

[Option ID = 42790]

3. $RC\frac{dV_c}{dt} - V_c$

[Option ID = 42791]

4. $RC\frac{dV_c}{dt} + V_c$

[Option ID = 42792]

12) It is required to find the current through a particular branch of a linear bilateral network without mutual coupling when the branch impedance takes four different values. Which one of the following methods will be preferred?[Question ID = 10699]

1. Superposition theorem [Option ID = 42793]
2. Thevenin's equivalent circuit [Option ID = 42794]
3. Mesh Analysis [Option ID = 42795]
4. Nodal analysis [Option ID = 42796]

13) A two port network is characterized by

$I_1 = 3\ V_1 + 4\ V_2$

$6\ I_2 = 2\ V_1 - 4\ V_2$

The A, B, C, D parameters for this network are

[Question ID = 10700]

1. 2, -3, 10, -9

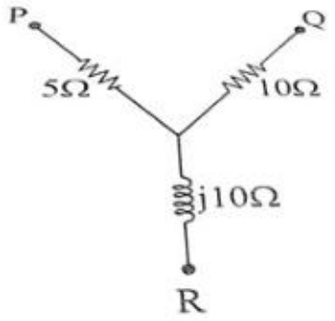
   [Option ID = 42797]
2. 2, 3, 6, 9

   [Option ID = 42798]
3. 3, 2, -9, 6

   [Option ID = 42799]
4. 3, -2, 9, -6

   [Option ID = 42800]

14) In the delta equivalent of the below star connected circuit, Z_{QR} is equal to



[Question ID = 10701]

1. 5 Ω

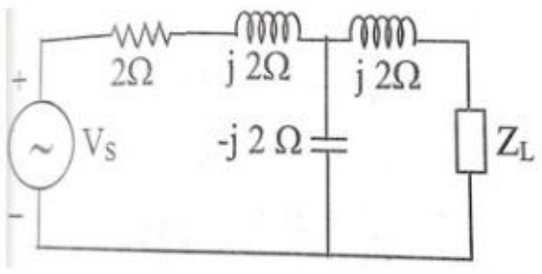
   [Option ID = 42801]
2. (10 + j30) Ω

   [Option ID = 42802]
3. 40 Ω

   [Option ID = 42803]
4. (20 + j10) Ω

   [Option ID = 42804]

15) Which one of the following impedance values of load will cause maximum power to be transferred to the load for the network shown in the figure?



[Question ID = 10702]

1. 2 Ω

   [Option ID = 42805]
2. - j2 Ω

   [Option ID = 42806]
3. (2 + 2j) Ω

   [Option ID = 42807]
4. (2 - 2j) Ω

   [Option ID = 42808]

16) Integrated Circuit based computers are started from which generation?[Question ID = 10703]

1. 3rd generation [Option ID = 42809]
2. 2nd generation [Option ID = 42810]
3. 1st generation [Option ID = 42811]
4. 4th generation [Option ID = 42812]

17) Which operating system doesn't support networking between computers?[Question ID = 10704]

1. Windows NT [Option ID = 42813]
2. Windows 2000 [Option ID = 42814]
3. Windows 95 [Option ID = 42815]
4. Windows 3.1 [Option ID = 42816]

18) In C language, what is the output of the following code

```
<#include<studio.h>

void f()
```

```
{
    static int i;
    ++i;
    printf("%d", i);
}
int main()
{
   f();
   f();
   f();
   f();
}
```

[Question ID = 10705]

1. 1111

   [Option ID = 42817]
2. 0000

   [Option ID = 42818]
3. Error

   [Option ID = 42819]
4. 1234

   [Option ID = 42820]

19) What will be the output of the following C code?

```
#include<studio.h>
    int main()
    {
        int c = 2 ^ 4;
        printf("%d\n", c);
    }
```

[Question ID = 10706]

1. error

   [Option ID = 42821]
2. 4

   [Option ID = 42822]
3. 6

   [Option ID = 42823]
4. 0

   [Option ID = 42824]

20) The number of digits required to represent a decimal number 31 in equivalent binary form are[Question ID = 10707]

1. 5 [Option ID = 42825]
2. 6 [Option ID = 42826]
3. 4 [Option ID = 42827]
4. 7 [Option ID = 42828]

21) The value of $\int_{0.1}^{1.1} xe^x \ dx$ by the using one-segment trapezoidal rule is most nearly

[Question ID = 10708]

1. 1.707

   [Option ID = 42829]
2. 2.707

   [Option ID = 42830]
3. 7.807

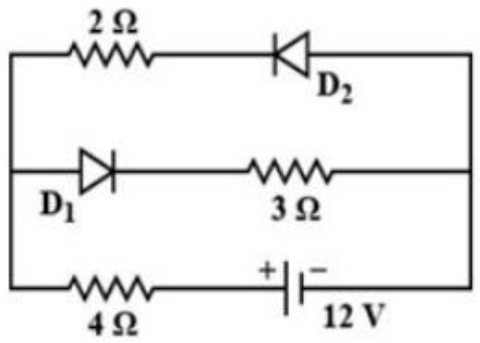
   [Option ID = 42831]
4. 4.672

   [Option ID = 42832]

22) If the ratio of the concentration of electrons to that of holes in a semiconductor is 7/5 and the ratio of currents is 7/4, then what is the ratio of their drift velocities?[Question ID = 10709]

1. 4/7 [Option ID = 42833]
2. 5/4 [Option ID = 42834]
3. 5/8 [Option ID = 42835]
4. 4/5 [Option ID = 42836]

23) The circuit has two oppositely connected ideal diodes in parallel. What is the current flowing in the circuit?



[Question ID = 10710]

1. 1.33 A [Option ID = 42837]
2. 2 A [Option ID = 42838]
3. 2.31 A [Option ID = 42839]
4. 1.71 A [Option ID = 42840]

24) The carrier mobility in a semiconductor is 0.4 m^2/V s. Its diffusion constant at 300 K will be (in m^2 / s)[Question ID = 10711]

1. 0.01 [Option ID = 42841]
2. 0.43 [Option ID = 42842]
3. 0.04 [Option ID = 42843]
4. 0.16 [Option ID = 42844]

25) A one-sided abrupt junction has 10^{21} /m^3 of dopants on the lightly doped side, zero bias voltage and a built in potential of 0.2 V. The depletion width of the abrupt junction is approximately

($q = 1.6 \times 10^{-19}$ C, $\varepsilon_r = 16$ and $\varepsilon_o = 8.875 \times 10^{-12}$ F/m)

[Question ID = 10712]

1. 0.6 μm
   [Option ID = 42845]
2. 3 μm
   [Option ID = 42846]
3. 0.036 μm
   [Option ID = 42847]
4. 1.5 μm
   [Option ID = 42848]

26) The Hall- coefficient of a specimen of doped semiconductor is 3.06×10^{-4} m^3 C^{-1} and the resistivity of the specimen is 6.93×10^{-3} Ωm. the majority carrier mobility will be:

[Question ID = 10713]

1. 0.0442 m^2 / V-sec
   [Option ID = 42849]
2. 0.024 m^2 / V-sec
   [Option ID = 42850]
3. 0.034 m^2 / V-sec
   [Option ID = 42851]
4. 0.0625 m^2 / V-sec
   [Option ID = 42852]

27) A schottky diode clamp is used along with switching BJT for[Question ID = 10714]

1. Reducing power dissipation [Option ID = 42853]
2. Increasing the value of current gain [Option ID = 42854]
3. Reducing switching time [Option ID = 42855]
4. Reducing the base current [Option ID = 42856]

28) If a p-n junction has doping densities $N_a = 3.5 \times 10^{18}$ cm^{-3} and $N_d = 2.5 \times 10^{15}$ cm^{-3} in the two regions then its built-in potential at 300 K is _____. (Take $n_i = 2.5 \times 10^{10}$ cm^{-3})[Question ID = 10715]

1. 0.393 V [Option ID = 42857]
2. 1.574 V [Option ID = 42858]
3. 0.787 V [Option ID = 42859]
4. 0 V [Option ID = 42860]

29) If a GaAs IMPATT diode has drift length of 3 μm and a carrier drift velocity of 1.5×10^7 cm/s then the drift time of the carrier and the operating frequency for this IMPATT diode are _____ and _____ respectively.[Question ID = 10716]

1. 4×10^{-9} s and 50 GHz [Option ID = 42861]
2. 2×10^{-6} s and 100 GHz [Option ID = 42862]
3. 2×10^{-11} s and 25 GHz [Option ID = 42863]
4. 1×10^{-10} s and 100 GHz [Option ID = 42864]

30) A 4 GHz carrier is DSB-SC modulated by a lowpass message signal with maximum frequency of 2MHz. The resultant signal is to be ideally sampled. The minimum frequency of the sampling impulse train should be[Question ID = 10717]

1. 8.004 GHz [Option ID = 42865]
2. 8 MHz [Option ID = 42866]
3. 4 MHz [Option ID = 42867]
4. 8 GHz [Option ID = 42868]

31) A 10MHz carrier is frequency modulated by a sinusoidal signal of 500 Hz, the maximum frequency deviation being 50 kHz. The bandwidth required, as given by Carson's rule is[Question ID = 10718]

1. 100kHz [Option ID = 42869]
2. 99kHz [Option ID = 42870]
3. 101kHz [Option ID = 42871]
4. 98kHz [Option ID = 42872]

32) The bit stream 01001 is differentially encoded using 'Delay and Ex-OR' scheme for DPSK transmission. Assuming the reference bit as a '1'and assigning phases of '0'and 'π'for 1's and 0's respectively, in the encoded sequence, the transmitted phase sequence becomes

[Question ID = 10719]

1. π π 0 π π

   [Option ID = 42873]
2. 0 π π π 0

   [Option ID = 42874]
3. 0 0 π π 0

   [Option ID = 42875]
4. π 0 π π 0

   [Option ID = 42876]

33) A source generates three symbols with probabilities 0.25, 0.25 and 0.50 at a rate of 3000 symbols per second. Assuming independent generation of symbols, the most efficient source encoder would have average bit rate is[Question ID = 10720]

1. 6000 bits/sec [Option ID = 42877]
2. 1500 bits/sec [Option ID = 42878]
3. 4500 bits/sec [Option ID = 42879]
4. 3000 bits/sec [Option ID = 42880]

34) A superheterodyne receiver operates in the frequency range of 58 MHz - 68 MHz. The intermediate frequency f_{IF} and local oscillator frequency f_{LO} are chosen such that $f_{IF} \leq f_{LO}$. It is required that the image frequencies fall outside the 58 MHz - 68 MHz band. The minimum required f_{IF} (in MHz) is[Question ID = 10721]

1. 5 MHz [Option ID = 42881]
2. 10 MHz [Option ID = 42882]
3. 15 MHz [Option ID = 42883]
4. 1 MHz [Option ID = 42884]

35) Coherent demodulation of FSK signal can be detected using[Question ID = 10722]

1. Bandpass filters and envelope detectors [Option ID = 42885]
2. Matched filter [Option ID = 42886]
3. Correlation receiver [Option ID = 42887]
4. Discriminator detection [Option ID = 42888]

36) Consider sinusoidal modulation in an AM systems. Assuming no over modulation , the modulation index (μ) when the maximum and minimum values of the envelope, respectively, are 4V and 2V is[Question ID = 10723]

1. 0.33 [Option ID = 42889]
2. 0.22 [Option ID = 42890]
3. 0.11 [Option ID = 42891]
4. 0.7 [Option ID = 42892]

37) The Nyquist sampling rate for the signal $s(t) = \frac{\sin(40\pi t)}{\pi t} \times \frac{\sin(60\pi t)}{\pi t}$ is given by

[Question ID = 10724]

1. 140 Hz

   [Option ID = 42893]
2. 100 Hz

[Option ID = 42894]

3. 120 Hz

[Option ID = 42895]

4. 50 Hz

[Option ID = 42896]

38) The divergence of the vector A = $e^{xy}\,\mathbf{a}_x + \cos^2 xz\,\mathbf{a}_z$ is

[Question ID = 10725]

1. $ye^{xy} + 2x\cos xz\sin xz$

[Option ID = 42897]

2. $ye^{xy} + 2x\sin xz$

[Option ID = 42898]

3. $ye^{xy} - 2x\sin xz\cos xz$

[Option ID = 42899]

4. $ye^{xy} - 2x\sin xz$

[Option ID = 42900]

39) If Electric flux density $D = 2y^2\mathbf{a}_x + 3\,xy\,\mathbf{a}_y + y\,\mathbf{a}_z\ C/m^2$, the volume charge density at (-1, 0, 2) is

[Question ID = 10726]

1. $0\ C/m^3$

[Option ID = 42901]

2. $-1\ C/m^3$

[Option ID = 42902]

3. $-2\ C/m^3$

[Option ID = 42903]

4. $-3\ C/m^3$

[Option ID = 42904]

40) Two point charges -4 μC and 4 μC are located at (2, -2, 3) and (1, 4, 1), respectively. Assuming zero potential at infinity, the potential at (1, 0, 1) is[Question ID = 10727]

1. -3 kV [Option ID = 42905]
2. -1 kV [Option ID = 42906]
3. -2 kV [Option ID = 42907]
4. -4 kV [Option ID = 42908]

41) Voltage applied across a dielectric produces an electrostatic 50 times greater than air. The dielectric constant of the dielectric will be[Question ID = 10728]

1. 5 [Option ID = 42909]
2. 10 [Option ID = 42910]
3. 20 [Option ID = 42911]
4. 50 [Option ID = 42912]

42) The electric field intensity in Styrofoam (ε_r = 1.03) filing the space between the plates of parallel-plate capacitor is 20 KV/m. The distance between the plates is 1.7 mm. Electric flux density D and the potential difference between the plates are respectively:

[Question ID = 10729]

1. 177 nC/m^2 and 30 V

[Option ID = 42913]

2. 177 nC/m^2 and 17 V

[Option ID = 42914]

3. 182.31 nC/m^2 and 17 V

[Option ID = 42915]

4. 182.31 nC/m^2 and 34 V

[Option ID = 42916]

43) A lossless transmission line of length 15 cm with L = 20μH/m, C = 45pF/m is opearated at 250 MHz. Its electrical length is

[Question ID = 10730]

1. π

[Option ID = 42917]

2. 2.25π

[Option ID = 42918]

3. 2.57λ

[Option ID = 42919]

4. 0.25λ

[Option ID = 42920]

44) The input impedance of a transmission line of length l < λ/4 and open circuited at the far end is

[Question ID = 10731]

1. resonative

[Option ID = 42921]

2. capacitive

[Option ID = 42922]

3. inductive

[Option ID = 42923]

4. resistive

[Option ID = 42924]

45) A lossless line of 50 Ω is terminated in a load of 100 Ω resistive. The VSWR of this line is

[Question ID = 10732]

1. 1:4

[Option ID = 42925]

2. 2:1

[Option ID = 42926]

3. 1:2

[Option ID = 42927]

4. 4:1

[Option ID = 42928]

46) The propagation constant of a transmission line with impedance and admittance of 9 and 16 respectively is[Question ID = 10733]

1. 225 [Option ID = 42929]
2. 12 [Option ID = 42930]
3. 25 [Option ID = 42931]
4. 144 [Option ID = 42932]

47) Normalized impedance of 0.3 + j0.4 lies in the[Question ID = 10734]

1. Lower half of the impedance smith chart. [Option ID = 42933]
2. Horizontal line of the chart. [Option ID = 42934]
3. Upper half of the impedance smith chart. [Option ID = 42935]
4. Vertical line of the chart. [Option ID = 42936]

48) A commonly used antenna for TV reception is[Question ID = 10735]

1. Log periodic antenna [Option ID = 42937]
2. Simple dipole antenna [Option ID = 42938]
3. Yagi antenna [Option ID = 42939]
4. Horn antenna [Option ID = 42940]

49) A reflex Klystron function as:[Question ID = 10736]

1. Microwave amplifier. [Option ID = 42941]
2. A high gain cavity. [Option ID = 42942]
3. Both as Microwave amplifier and oscillator. [Option ID = 42943]
4. Microwave oscillator. [Option ID = 42944]

50) Radiation resistance of a current element of length dl is

[Question ID = 10737]

1. $80\left(\frac{\pi dl}{\lambda}\right)$ ohms

[Option ID = 42945]

2. $80\left(\frac{\lambda dl}{\pi}\right)^2$ ohms

[Option ID = 42946]

3. $80\left(\frac{\lambda dl}{\pi}\right)$ ohms

[Option ID = 42947]

4. $80\left(\frac{\pi dl}{\lambda}\right)^2$ ohms

[Option ID = 42948]