

Course Code : MET 151

WYZX/RW-21/1001

First / Second Semester B. Tech. / Bachelor of Engineering /  
Biomedical Engineering Examination

ENGINEERING GRAPHICS AND DESIGN

Time : 2 Hours]

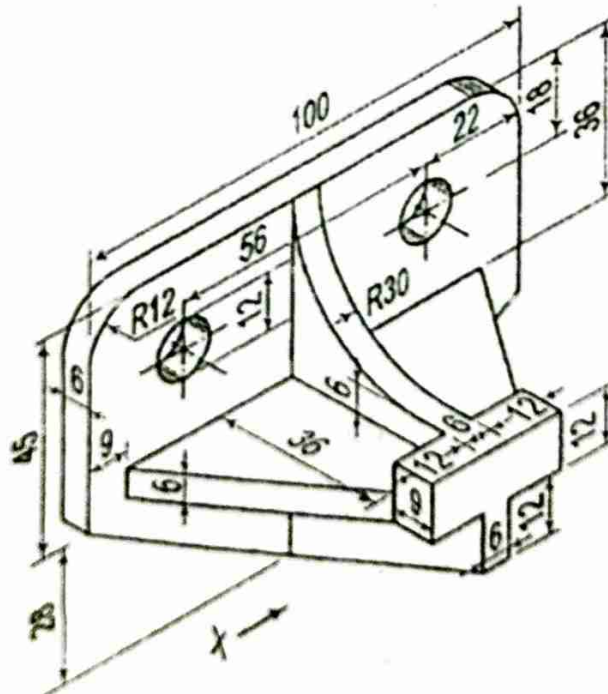
[Max. Marks : 40

Instructions to Candidates :—

- (1) All questions carry marks as indicated.
- (2) Due credit will be given to neatness.
- (3) Assume suitable data / dimensions wherever necessary.
- (4) Retain construction lines.

1. The major-axis AB of an ellipse is 140 mm long with P as its mid-point. The foci F1 and F2 of the ellipse are 48 mm away from the mid-point P. Draw the ellipse and find the length of the minor axes. 8 (CO 1)

2. Draw Front view (in the direction of X) and Top view of the following :



8 (CO 2)

WYZX/RW-21/1001

Contd.

3. A line AB 75 mm long, has its end A in the V.P. and the end B in the H.P. The line is inclined at  $30^\circ$  to the H.P. and at  $60^\circ$  to the V.P. Draw its projections. 8 (CO 3)

OR

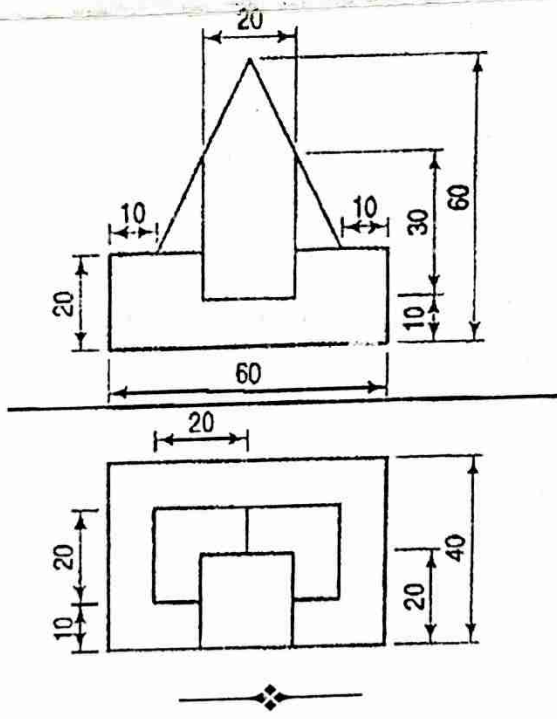
Draw the projections of a circle of 50 mm diameter resting in the HP on a point A on the circumference, its plane inclined at  $45^\circ$  to the HP and the diameter AB makes an angle of  $30^\circ$  with the VP. 8 (CO 3)

4. A hexagonal pyramid, base 25 mm side and axis 55 mm long, has one of its slant edges on the ground. A plane containing that edge and the axis is perpendicular to the H.P. and inclined at  $45^\circ$  to the V.P. Draw its projections when the apex is nearer the V.P. than the base. 8 (CO 3)

OR

A square pyramid, base 40 mm side and axis 65 mm long, has its base on the HP and all the edges of the base equally inclined to the VP. It is cut by a section plane, perpendicular to the VP, inclined at  $45^\circ$  to the HP and bisecting the axis. Draw its sectional top view and true shape of the section and Development. 8 (CO 4)

5. Draw isometric view of following orthographic views.



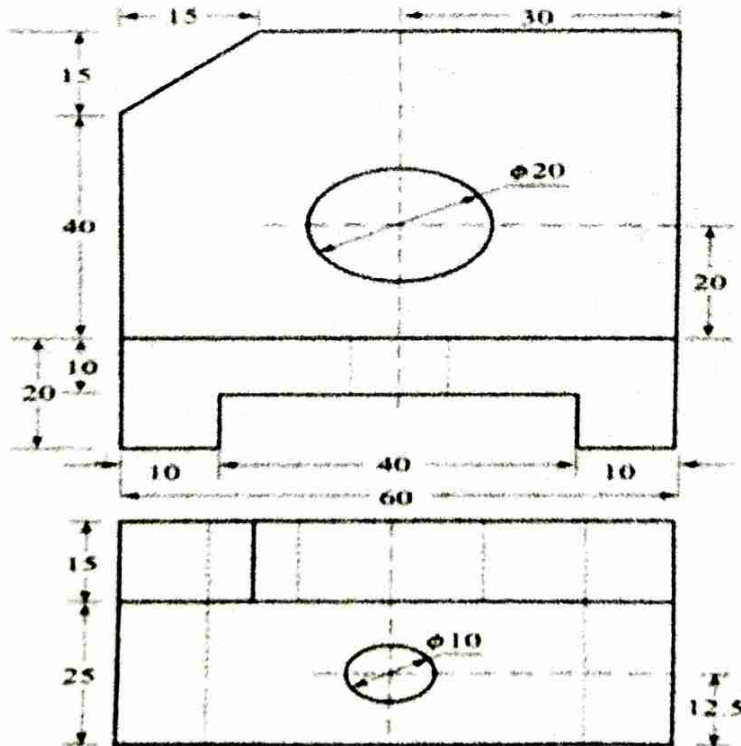
8 (CO 2)

ACAD- 27 a)	ShriRamdeobaba College of Engineering & Management, Nagpur -440013	Iss No.: 01, Rev: 00
Department: Mechanical Engineering		Date of Rev: 01/01/2018
Program: U.G.	Semester: I Course Code: MET 151 Course Name: Engineering Graphics & Design Test-II	Page 1/1
		Date of Exam: 20-04-2022
Max Marks: 15	Session: 2021-22	Time: 1:30 Hour

**Instructions to Candidates:**

- 1) All questions carry marks as indicated.
- 2) Due credits will be given to neatness.
- 3) Assume suitable data/ dimensions wherever necessary.
- 4) Retain construction lines.

Q. No.		Marks	COs
Q.1	A pentagonal lamina of edges 30 mm is resting on HP with one of its corners such that the edge opposite to this corner is 20 mm above HP and makes an angle of $45^\circ$ with VP. Draw the top and front views of the plane lamina in this position.	(05)	CO3
Q.2	A hexagonal prism, side of base 30 mm and axis length 50 mm is kept on the HP on its base with two edges of base parallel to VP. It is cut by a sectional plane inclined at $45^\circ$ to HP and perpendicular to VP and intersecting the axis of the prism at a distance of 40 mm above the base. Draw front view, sectional top view, true shape and development.	(05)	CO4
Q.3	Draw isometric view of a casting, two views of which are shown in figure below.	(05)	CO2



Course Code : EET 151

WYZX/RW-21/1020

First/Second Semester B. Tech./Bachelor of Engineering Examination

## BASIC ELECTRICAL ENGINEERING

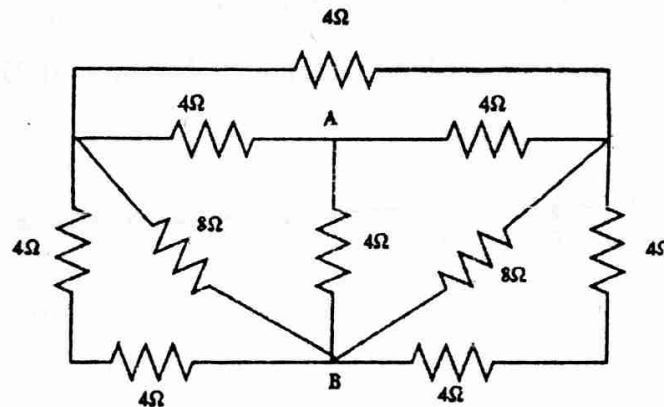
Time : 2 Hours]

[Max. Marks : 40

## Instructions to Candidates :—

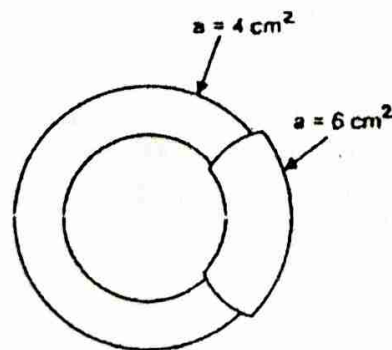
- (1) Assume suitable data wherever necessary.
- (2) Illustrate your answers wherever necessary with the help of neat diagrams.

- 1/ (a) Find the equivalent resistance between the terminals A and B using star delta transformation.



5(CO1)

- (b) An uneven ring-shaped core shown in figure<sub>2</sub> below has  $\mu_r = 1000$  and the flux density in the thicker section is to be 0.75T. If the current through a coil wound on the core is to be 500 mA, determine number of coil turns required. Total circumference mean length of ring is 30 cm and length of thicker section is 10 cm.



5(CO1)

✓ 2. ✓ (a) A coil of power factor 0.8 is connected in series with 110 micro-farad capacitor. The supply frequency is 50 Hz. The potential difference across the coil is found to be equal the potential difference across the capacitor. Calculate the resistance and inductance of the coil. 4(CO1)

✓ (b) 230 V, three phase supply is connected across a balance load of three resistances consisting of 24 ohm each. Determine the current drawn from the power mains if three resistances are

(a) Star connected and

(b) Delta connected.

Also calculate power consumed in each case.

3(CO1)

✓ 3. ✓ (a) State and explain :

✓ (i) Different components of power converters.

✓ (ii) State and draw block schematic diagram of DC to DC converter.

✓ (iii) State its application.

5(CO3)

✓ (b) Draw block diagram for Nuclear power generation plant. List out merits and demerits of the same. 3(CO4)

✓ (c) Why three phase system is most popular in world ? 2(CO4)

✓ 4. ✓ (a) 20KVA, 1 Phase, 50Hz, 2200/200V transformer has following test results.

OC Test : 2200V, 0.9A, 400W(On HV side)

SC Test : 200V, 9.09A, 500W(On HV Side)

Calculate efficiency and regulation of transformer at 0.9 PF lead at full load. 5(CO2)

✓ (b) A three-phase line voltage of 11kV is connected to primary winding of 3 phase, 50 Hz transformer. It has 1000 turns on primary and 110 turns on secondary side. Determine the secondary voltage on no load when the transformer is connected

(i) Star/delta

- (ii) Delta/star
- (iii) Delta/delta

3(CO2)

5. ✓ (a) What do you understand by BACK EMF in DC motor ? Explain in detail. 2(CO2)
- ✓ (b) A 3 phase, 50 Hz, Induction motor is running at slip of 4% with speed of 1440 RPM.
- ✓ (i) At what speed rotating magnetic field must be rotating ?
  - ✓ (ii) Rotor current frequency at 1200 rpm. 3(CO2)



ACAD-27 a)	Shri Ramdeobaba College of Engineering and Management, Nagpur -440013	Iss. No.: 01, Rev. No.: 00
Ref. Clause(s): 9.1		Date of Rev: 01/01/2018
Department: ELECTRICAL	Semester: I Course Code: EET151 Course Name: Basic Electrical Engineering	Page: 01/01
Programme: B. Tech.	Test: II	Date of Exam: 21/4/2022
Max Marks: 15	Session: 2021-22 (ODD)	Time: 1 pm to 2 pm

Instructions: Assume suitable data wherever necessary.

Que

Statement of Question

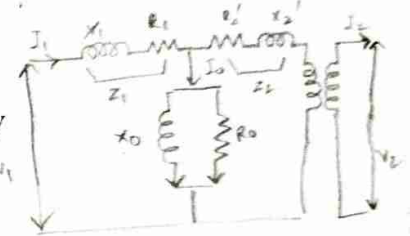
Marks

COs  
Mapped  
CO2

40

② Q.1 ✓

A 250/500 V, single phase transformer gave the following test results  
Short circuit test (L V Short circuit): 20 V, 12 A, 100 W  
Open circuit Test (L V Side): 250 V, 1 A, 80 W  
Determine i) Efficiency of transformer when the output is 12 A, 500 V  
at 0.85 power factor lagging.



ii) Draw Equivalent circuit diagram of a transformer referred to primary side.

02

01)

Q.2 ✓

Draw well labelled phasor diagram of transformer on no load. Mention all the parameter

03

CO2

01)

Q.3 ✓

A 3 phase, 4 pole Induction motor is supplied from 3 phase, 50 Hz supply. Calculate : i) Synchronous speed  
ii) Rotor speed when slip is 4%  
iii) Rotor frequency when rotor runs at 600 rpm  
iv) Rotor frequency at stand still  
v) Rotor frequency at synchronous speed.

02

CO2

CO1)

② Q.4 ✓

Derive torque equation of DC Motor

04

CO3

:

Q.5 ✓

State different types of power converters and explain in detail cycloconverter with its applications

CO3)

Cont

$$T = T_r \sin \phi$$

Doc. No.: FY-ACAD-33a	Shri Ramdeobaba College of Engineering and Management, Nagpur - 440 013	Iss. No.: 01 Rev. No.: 00
Clause No.: 9.1		Date of Rev.: 01/01/2018
Department: Mathematics	Name of Internal Examination: <u>Test II</u> Session: <u>2021-2022</u> Semester: <u>First</u>	Page: 1/1
Programme: BE.FY		For Sections A,B,C,D,E,F,G
Course Code: <u>MAT152</u>	Course Name: <u>Differential equation, Linear Algebra Probability &amp; Statistics</u>	Date of Exam: <u>18/04/2022</u>
Maximum Marks: <u>15 M</u>		Timing: <u>10.00 am to 11.00 am</u>
		Duration: <u>One Hour</u>

Instructions: Use of Normal Distribution table is permitted.

Q.1	Compulsory question	Marks	CO																						
a)	Are the following vectors Linear Dependent? If so find their Linear combination  $X_1 = [1,2,4], X_2 = [2,-1,3], X_3 = [0,1,2], X_4 = [4,2,9]$	03	CO2																						
Q.2)	Solve any three questions.																								
	Find the <u>rank</u> correlation coefficient for the data	04	CO3																						
	<table border="1"> <tr> <td>X</td> <td>10</td> <td>12</td> <td>14</td> <td>10</td> <td>18</td> <td>10</td> <td>20</td> <td>25</td> <td>18</td> <td>25</td> </tr> <tr> <td>Y</td> <td>20</td> <td>40</td> <td>38</td> <td>28</td> <td>40</td> <td>28</td> <td>40</td> <td>50</td> <td>38</td> <td>45</td> </tr> </table>	X	10	12	14	10	18	10	20	25	18	25	Y	20	40	38	28	40	28	40	50	38	45		
X	10	12	14	10	18	10	20	25	18	25															
Y	20	40	38	28	40	28	40	50	38	45															
b)	Find the modal matrix P that reduces the matrix  $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$ to its <u>diagonal</u> form .	04	CO2																						
c)	A random variable X has density function f(x)  $f(x) = \begin{cases} cx & 1 \leq x \leq 3 \\ cx^3 & 3 \leq x \leq 4 \\ 0 & \text{otherwise} \end{cases}$ Find i) c ii) $P(2.5 \leq X \leq 3.5)$ iii) <u>Distribution function F(x)</u>	04	CO3																						
d)	The mean height of 1000 students in a class is <u>156 cm</u> and the standard deviation is <u>18 cm</u> . Assuming that the heights are normally distributed. Find the number of students with height  1) between <u>160cm</u> and <u>180cm</u> 2) more than <u>165cm</u> 3) less than <u>140cm</u> 4) equal to <u>162cm</u>	04	CO3																						

$$f(x) \Rightarrow \int cx + \int cx^3$$

2



Course Code : MAT 152

WYZX/RW-21/1006

First/Second Semester B. Tech./Bachelor of Engineering/(Biomedical Engineering/(Computer Science and Engineering) (Cyber Security)/ (Data Science)/(AI and ML) Examination

**DIFFERENTIAL EQUATIONS, LINEAR ALGEBRA, STATISTICS AND PROBABILITY**

Time : 2 Hours]

[Max. Marks : 40

Instructions to Candidates :—

- (1) Use of non-programmable calculator is allowed.
- (2) All questions carry marks as indicated against them.
- (3) Use of Statistical tables are allowed.

Solve the following questions :

1. (a) Solve the following differential equation : 4(CO1)  
 $x^2ydx - (x^3 + y^3) dy = 0$
- (b) Solve the following differential equation : 4(CO1)  
 $(xysinxy + cosxy)ydx + (xysinxy - cosxy)xdy = 0$
2. (a) Solve the following differential equation 4(CO1)  
 $(x^2D^2 + 3xD + 5)y = 10 - \frac{4}{x}$
- (b) Solve the following differential equation 4(CO1)  
 $(D^2 - 4D + 4)y = 8x^2e^{2x}\sin 2x$
3. (a) Fit a least square geometric curve  $y = ax^b$  to the following data : 4(CO3)
- |   |     |   |     |   |      |
|---|-----|---|-----|---|------|
| x | 1   | 2 | 3   | 4 | 5    |
| y | 0.5 | 2 | 4.5 | 8 | 12.5 |

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Contd.

(b) Obtain the rank correlation coefficient for the following data

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

4(CO3)

4. (a) The mean grade in a final examination was 72 and the standard deviation was 9. The top 15% of the students are to receive A's. What is the minimum grade a student must get in order to receive an A ?

4(CO3)

(b) Find the probability of getting at least 6 of the ten answers in a true-false examination.

4(CO3)

5. (a) Examine the following vectors for linear dependence and find the relation if exists.

$X_1 = (1, 2, 4), X_2 = (2, -1, 3), X_3 = (0, 1, 2), X_4 = (-3, 7, 2)$

4(CO1)

(b) Apply Caley-Hamilton theorem to find

$A^{-1}$  if  $A = \begin{bmatrix} 4 & 3 & 1 \\ 2 & 1 & -2 \\ 1 & 2 & 1 \end{bmatrix}$

4(CO1)



Course Code : PHT 156

WYZX/RW-21/1019

First/Second Semester B. Tech./B. E. (Electronics Engineering/Electronics and Communication Engineering/Computer Science and Engineering/Data Science/Information Technology) Examination

SEMICONDUCTOR PHYSICS

Time : 2 Hours ]

[Max. Marks : 40

Instructions to Candidates :—

- (1) All questions are compulsory.
- (2) Diagram should be given wherever necessary.
- (3) Data  $K = 1.38 \times 10^{-23} \text{ J/k}$ ,  $m_e = 9.11 \times 10^{-31} \text{ Kg}$
- (4) Assume suitable data wherever required.

1. (a) Doubly ionized lithium ( $\text{Li}^{++}$ ) is a hydrogen like atom. Compute the first two energy levels for electrons of this atom. (Atomic no (z) of Li = 3) 2(CO1)
- (b) Compare the following :
  - (i) Planck's law and de Broglie's law
  - (ii) Phase velocity and group velocity
  - (iii) Wave nature of electron and particle nature of electron 3(CO1)
- (c) Explain the phenomenon of tunneling with well labeled diagram. 2(CO1)
2. (a) What are the basic assumptions made for developing Kronig-Penny Model? Why there is a need to introduce Bloch function ? 2(CO2)
- (b) Draw the E-K diagram showing :
  - (i) Allowed energy band and forbidden energy band gap when electron is bound within the lattice.
  - (ii) When electron is free. 2(CO2)

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Contd.

- (c) Give the concept of effective mass and derive the expression for it. 3(CO2)
3. (a) Intrinsic semiconductor at absolute temperature behaves as an insulator. Justify this statement with suitable energy band diagram. 2(CO2)
- (b) Equilibrium distribution of electrons and holes can be represented by the plot against  $E$  versus  $f(E)$ . Draw the density of state functions, Fermi-Dirac probability function and the area representing electron and hole concentrations when  $E_F$  is below the intrinsic Fermi energy. 3(CO2)
- (c) The electron diffusion coefficient of a semiconductor at  $T = 300K$  is  $215 \text{ cm}^2/\text{s}$ . Determine the electron mobility. 2(CO2)
4. (c) What is generation and recombination rate Obtain an expression for recombination rate assuming low level injection for p-type semiconductor. 3(CO3)
- (b) Consider a semiconductor in which  $n_0 = 10^{15} \text{ cm}^{-3}$  and  $n_i = 10^{10} \text{ cm}^{-3}$ , Assume that the excess-carrier lifetime is  $10^{-6} \text{ s}$ . Determine the electron-hole recombination rate if the excess-hole concentration is  $\delta p = 5 \times 10^{13} \text{ cm}^{-3}$ . 3(CO3)
- 5 (a) Give the concept of potential barrier for p-n junction with suitable diagram. A silicon p-n junction with doping densities  $N_a = 1 \times 10^{18} \text{ cm}^{-3}$  and  $N_d = 1 \times 10^{15} \text{ cm}^{-3}$  operated at  $T = 300K$ . Assuming  $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$ , calculate the built in potential barrier in a p-n junction. 3(CO4)
- (b) Draw the energy band diagram for p-n junction when it is  
(i) zero bias (ii) forward bias. 3(CO4)
6. (a) Give the principle and operation of a light emitting diode. 3(CO4)
- (b) What is the photovoltaic effect ? What is the absorption spectrum of a solar cell material ? How is it important for efficiency of the cell ? 2(CO4)
- (c) Silicon semiconductor when exposed to the incident wavelength  $\lambda = 1.0 \mu\text{m}$ , will absorb 90 percent of the incident photon energy. What will be the thickness of the semiconducting material ? Given  $\alpha = 10^2 \text{ cm}^{-1}$ . 2(CO4)

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2

$$J = \frac{Dn}{\mu_n \tau_n}$$

$$\lambda = 1.0 \mu\text{m}$$

$$\frac{J(d)}{J_0} = e^{-\alpha d} = e^{-10^2 d}$$

$$J(d) = 2.688 \times 10^{43} J_0$$

$$= 2.4192 \times 10^{45}$$

ACAD-27 a)	Shri Ramdeobaba College of Engineering & Management, Nagpur -440013	Rev: 03
Ref. Clause(s): 9.1		Date of Rev: 01/01/2018
Department: B.E. First Year	Semester: II EC /EN/ IT Course Code: PHT156 Course Name: Semiconductor Physics	Page: 01/01
Program: B.E.	Test-II	Date of Exam: 19 <sup>th</sup> April, 2022
Max Marks: 15	Session: 2021-22	Time: 1Hour

**Instructions:**

- Assume suitable data whenever necessary. Boltzmann Constant,  $k = 8.617 \times 10^{-5} \text{ eV K}^{-1}$
- All questions are Compulsory

Q. No.	Questions	Marks	CO
1.	The concentration of donor impurity atoms in silicon is $N_d = 10^{15} \text{ cm}^{-3}$ . Assume an electron mobility of $\mu_n = 1300 \text{ cm}^2/\text{V-s}$ and a hole mobility of $\mu_p = 450 \text{ cm}^2/\text{V-s}$ . (a) Calculate the resistivity of the material. (b) What is the conductivity of the material	2	CO 3
2.	Establish relation between mobility and diffusion constant for doped semiconductor in thermal equilibrium.	2	CO 3
3.	What is Ambipolar transport and write down the equation with details of all the terms involved in it.	2	CO 3
4.	If the excess carrier concentration is $10^{15} \text{ cm}^{-3}$ and the minority carrier life time is $4 \mu\text{s}$ , then determine the excess carrier recombination rate.	2	CO 3
5.	Consider a uniformly doped Si PN junction with doping concentration $N_a = 5 \times 10^{17} \text{ cm}^{-3}$ and $N_d = 10^{17} \text{ cm}^{-3}$ . a) calculate $V_{bi}$ at $T=300\text{K}$ b) Determine at which temperature $V_{bi}$ decrease by 10 percent. (Given: $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$ )	2	CO 3
6.	Draw well labelled energy band diagram for pn junction under thermal equilibrium and forward bias.	2	CO 3
7.	Explain the construction and working mechanism of solar cells with suitable diagram.	2	CO 4
8.	What will be the order of bandgap for visible wavelength $6530 \text{ \AA}$ of LED fabricated by the material GaAsP.	1	CO 4

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