



Continuous Assessment Test (CAT) – I AUGUST 2025

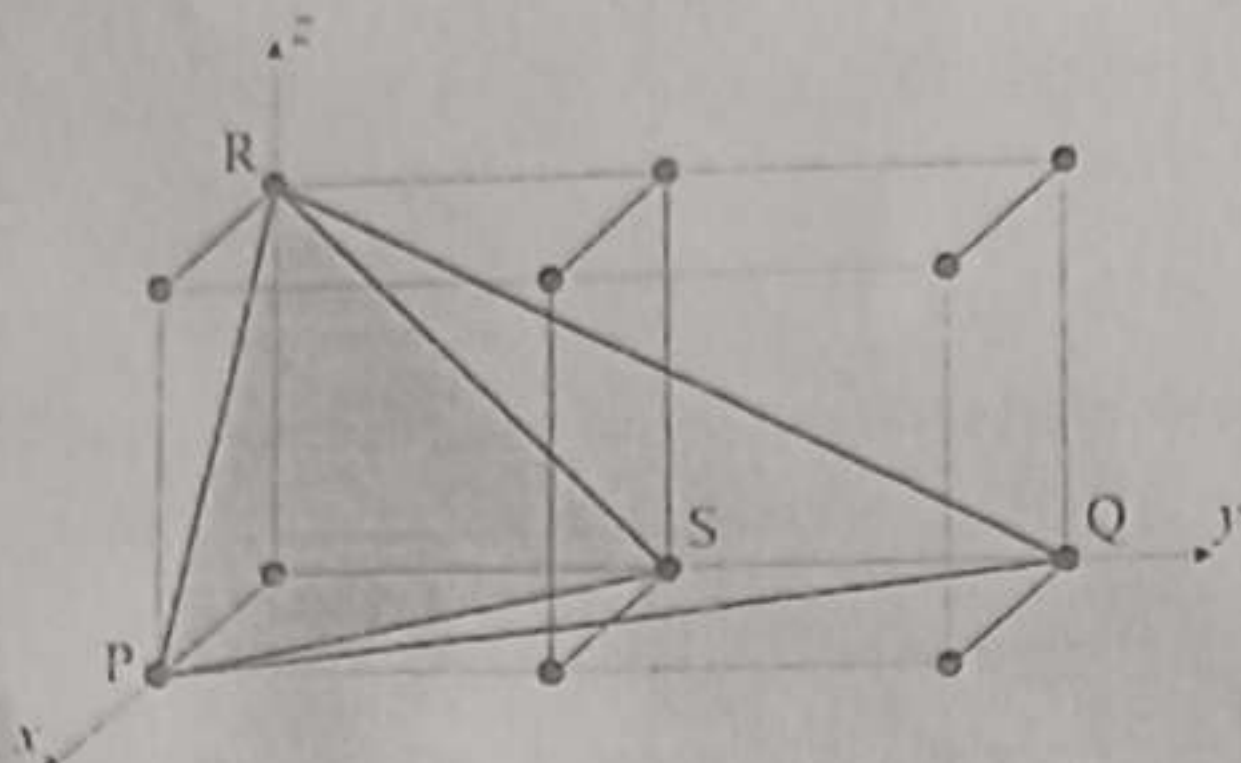
Programme	: B.Tech BVD	Semester	: FS 2025-26
Course Code & Course Title	: BEVD101L Electronic Materials	Class Number	: CH2025260100500
Faculty	: Dr. Anisha Natarajan	Slot	: C1+TC1
Duration	: 90 Minutes	Max. Mark	: 50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Only non-programmable calculator without storage is permitted
- Useful constants:
 - Electronic charge: $1.602 \times 10^{-19} \text{ C}$
 - Mass of the electron in free space: $9.10939 \times 10^{-31} \text{ kg}$
 - Avogadro's number: $6.0221 \times 10^{23} \text{ mol}^{-1}$
 - Boltzmann constant: $1.3807 \times 10^{-23} \text{ J K}^{-1}$

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level
1.	(a)	Platinum (Pt) has the FCC crystal structure. The radius of the Pt atom is 0.1386 nm. The atomic mass of Pt is 195.09 amu (g mol^{-1}). Calculate the number of Pt atoms per unit volume and density of Pt. (5 marks)	10	CO1	K3
	(b)	Consider the bcc unit cells of the solids 1 and 2 with the position of atoms as shown in Figure 1. The radius of atom B is twice that of atom A. The unit cell edge length is 50% more in solid 2 than in solid 1. What is the approximate packing efficiency in solid 2? (5 marks) Solid 1 Solid 2 Figure 1			
2	(a)	Show that the spacing between adjacent (hkl) planes in a cubic crystal is given by: (3 marks) $d = \frac{a}{\sqrt{h^2 + k^2 + l^2}}$	10	CO1	K3
	(b)	What are the interplanar spacings d for the (100), (110), and (111) planes of Al ($a = 4.05 \text{ \AA}$)? (3 marks)			

	(c)	Determine the Miller Indices of the planes PSR and PQR shown in Figure 2. (4 marks)  Figure 2.			
3.		The resistivity of aluminium at 25°C has been measured to be $2.72 \times 10^{-8} \Omega \text{ m}$. The thermal coefficient of resistivity of aluminium at 0°C is $4.29 \times 10^{-3} \text{ K}^{-1}$. Aluminium has a valency of 3, a density of 2.70 g cm^{-3}, and an atomic mass of 27. (a) Calculate the resistivity and thermal coefficient of resistivity of Aluminium at -30 °C. (5 marks) (b) Estimate the mean free time between collisions for the conduction electrons in Aluminium at 25 °C, and hence estimate their drift mobility. (5 marks)	10	CO2	K4
4.	(a)	A semiconductor sample of width 0.5mm is placed in a magnetic field of 500 Gauss. If the probe current and Hall voltage are 5.1 mA and 6.3 mV respectively, find the Hall coefficient and carrier concentration in the semiconductor. (6 marks)	10	CO2	K2
	(b)	Describe the effect of temperature on the resistivity of metals and metallic alloys. (4 marks)			
5.		In a photoelectric experiment, it was found that the stopping potential decreases from 1.85 V to 0.82 V as the wavelength of the incident light varies from 300 nm to 400 nm. Calculate the value of Planck's constant from this data.	10	CO2	K3
*****All the best *****					