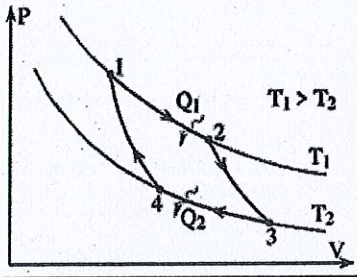
Eng physics-1

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST -3 EXAMINATION- 2025
B.Tech-I Semester (CSE/IT/ECE/CE)

COURSE CODE (CREDITS): 25B11PH111 (04) MAX. MARKS: 35
COURSE NAME: PHYSICS-1
COURSE INSTRUCTORS: PBB, SKK, VSA, SKT, SBA, HSR, HAZ MAX. TIME: 2 Hour

Note: (a) All questions are compulsory. Symbols have their usual meanings. Calculators are allowed.

Q.No	Question	CO	Marks
Q1	(a) If a grating with 1000 lines/cm produces a first-order fringe at 19.2 cm on a screen 4 m away, what is the wavelength of the light? (b) State and explain Malus law with a figure. What angle is needed between the direction of polarized light and the axis of a polarizing filter to reduce its intensity by 90.0%?	3 4	3+3
Q2	(a) Show that the average intensity over a complete period (cycle) from the output of the YDSE is equal to the sum of individual intensities from two slits. (b) In a photoelectric experiment both sodium (work function = 2.3 eV) and tungsten (work function = 4.5 eV) metals were illuminated by the ultraviolet lights of same wavelengths. If the stopping potential for tungsten is measured to be 1.8 V, what will be the stopping potential for sodium?	1 3	3+2
Q3	(a) A beam of X-rays of wavelength 0.2 nm is incident on a free electron and gets scattered in a direction with respect to the direction of the incident radiation resulting in maximum wavelength shift. What is the percentage energy loss of the incident radiation? (b) What is de Broglie hypothesis? What is the speed of an electron whose de Broglie wavelength is equal to its Compton wavelength?	3 4	2+2
Q4	(a) The ground state of Nb has the electron configuration $[Kr]4d^4 5s^1$. What is the corresponding ground state term symbol? (b) A sample of certain element is placed in a magnetic field of flux density 0.3 Tesla. How far apart is the Zeeman component of a spectral line of wavelength 450 nm?	4 3	1+2
Q5	(a) Derive energy-momentum relation in special theory of relativity. (b) With what velocity a particle should move so that its mass appears to increase by 20% of its rest mass?.	1 2	3+2
Q6	 A carnot cycle is illustrated in the given figure. Calculate the following parameters: (a) Ratio of work done in process 1 → 2 and 2 → 3, in terms of T_1 and T_2. (b) Show that T_2 cannot be zero or negative. (c) Show that Q/T is constant.	 2 4 2	3+2+1
Q7	(a) A quantity of dry air at 27°C is compressed (i) slowly and (ii) suddenly to one third of its volume. Find the change in temperature in each case, assume $C_p/C_v = 1.4$ for dry air. (b) A mass m of a liquid at temperature T_1 is mixed with an equal mass of same liquid at temperature T_2. The system is thermally insulated; calculate the change of entropy of both liquids. (c) One mole of a gas at temperature T expands isothermally to four times of it's volume. Calculate the change in its entropy in terms of gas constant.	3 4 3	2+2+2

Constants: $e=1.6\times10^{-19}$ C; $h=6.626\times10^{-34}$ Js; $m=9.11\times10^{-31}$ kg; $c=3\times10^{8}$ m/s; $k_B=1.38\times10^{-23}$ J/K;