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Roll No.

SECOND SEMESTER

B.E. (BT)

MID SEMESTER EXAMINATION **MARCH** 2005

BT-112 PHYSISCS-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Attempt **ALL** questions.
Assume suitable missing data, if any.

- 1[a] What are de Broglie matter waves and discuss the physical significance of wave function ψ . 1
- [b] Discuss the importance of Heisenberg's uncertainty principle. The average period that elapses between the excitation of an atom and time it radiates is 1.0×10^{-8} sec. Find the inherent uncertainty in the frequency. 2
- [c] State the postulates of wave mechanics. Derive Schrödinger's equation. Find the probability that a particle trapped in a box L wide can be found between 0.45L and 0.55 L for ground and first excited states. 2
- 2[a] Explain the meaning of 'mean free path' of molecules of a gas. 1
- [b] Calculate mean free path of a gas molecules at NTP if diameter of molecules is 3×10^{-8} cm and $k = 1.38 \times 10^{-16}$ ergs/degree. 1 ½
- [c] Differentiate between (i) Bose-Eiustion and (ii) Fermi-Dirac statistics. A gas has only three particles show with the help of diagrams how particles can be arranged using F.D. and B.E. statistics. 2½

OR

- (i) What do you mean by 'expectation value' of a wave function? Explain with suitable example. 1
- (ii) Distinguish between different types magnetic materials. Mention their different applications in engineering. 2
- 3[a] What is 'Meissner Effect'? Explain why Meissner effect and not zero resistivity is considered to be the 'sure signature' of super conductivity? 2
- [b] What is Josephson effect? Briefly explain ac Josephson effect and discuss its significance. 2
- [c] What is 'SQUID'? What is its utility? Briefly discuss its working. 1 ½
- 4[a] Define 'polarization'? Briefly discuss orientational polarization. Do the non-polar dielectrics show orientational polarization? 2
- [b] Define the term 'Dielectric strength' and explain the importance of its knowledge in deciding the utility of dielectrics. 1 ½
- [c] What are 'ferroelectric materials' and 'piezoelectric materials'? Give their examples. 1 ½

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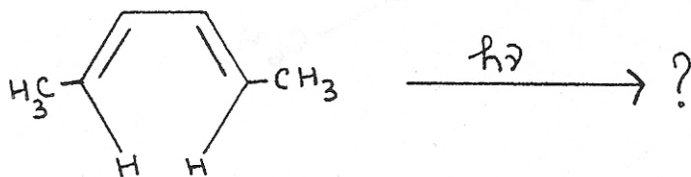
BT-113 CHEMISTRY-II

Time: 1 Hour 30 Minutes

Max. Marks : 20

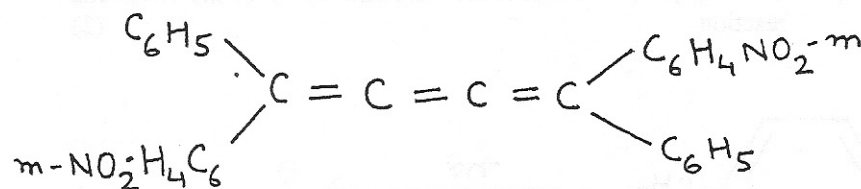
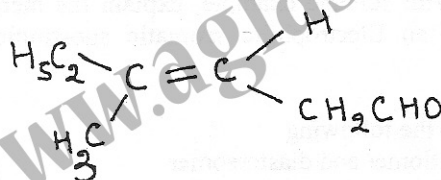
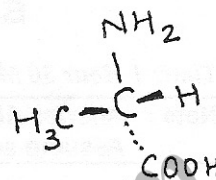
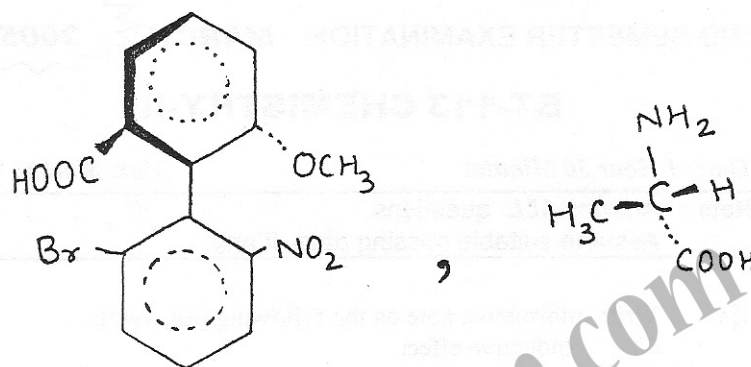
Note : Answer **ALL** questions.
Assume suitable missing data, if any.

- 1[a] Write informative note on the following (*any two*):-
(i) Inductive effect
(ii) Hyper conjugation
(iii) Carbene (2x3=6)
- [b] What do you understand by Electrophilic Aromatic substitution reaction? With suitable example, explain the mechanism and evidence of an Electrophilic aromatic substitution reaction. (4)
- 2[a] Differentiate the following
(i) Enantiomer and diastereomer
(ii) Configuration and Conformation (4)
- [b] Draw neat structures of trans-decalin and cis-decalin and discuss its stereochemistry. (2)
- [c] Give the product and discuss stereochemistry of the following reaction - (2)



[d] Assign R-S or E-Z configuration, of the following

(2)



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B.E. (BT)

MID SEMESTER EXAMINATION **MARCH** 2005

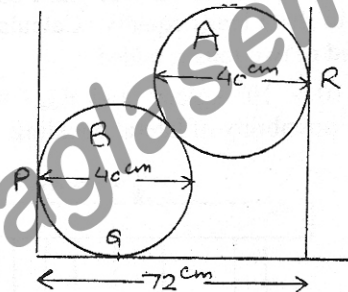
BT-114 MECHANICAL SCIENCES

Time: 1 Hour 30 Minutes

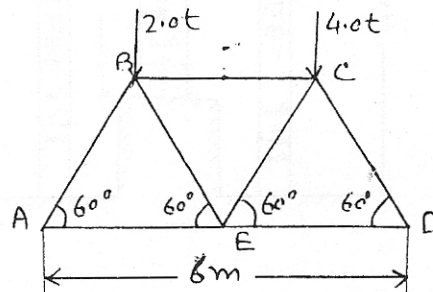
Max. Marks : 20

Note : Attempt **ALL** questions.
Assume suitable missing data, if any.

- 1[a] Establish relationship between modulus of Elasticity and Bulk Modulus of a material. 2
- [b] A piece of material is subjected to tensile stresses of p_1 and p_2 at right angles to each other ($p_1 > p_2$). Find the plane across which the resultant stress is most inclined to the normal to it. 3
- [c] Two smooth spheres A and B each of diameter 40 cm and weight 20 kg rest in a horizontal channel having vertical walls and base width of 72 cm as shown. Find out reactions at P, Q and R. 3

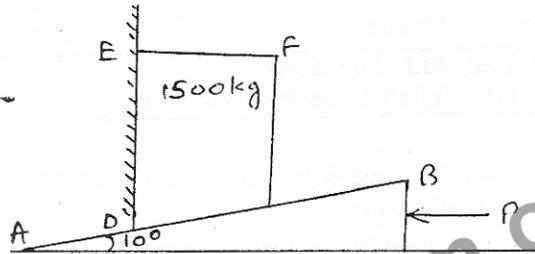


2. Following figure shows a Warren girder consisting of seven members each of 3 m length freely supported at its end points. 4



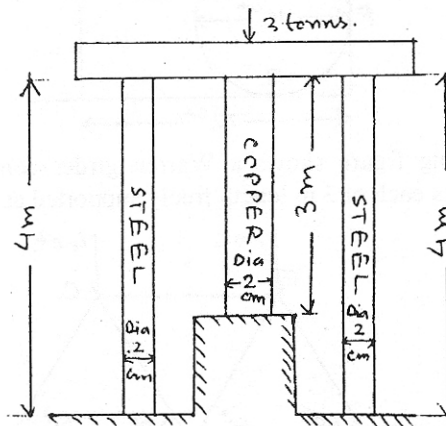
The girder is loaded at B and C as shown. Find the forces in all the members of the girder, indicating whether the forces are tensile or compressive.

3. A block weighing 1500 kg is to be raised by means of a 10° wedge. Assuming the coefficient of friction between all the contacting surfaces to be 0.3, determine what minimum horizontal force P, should be applied to raise the block. 4



4. A load of 3 tonnes is jointly supported by three equidistant vertical rods in the same vertical plane as shown. The rods so adjusted as to share loads equally. Calculate the final stresses, if a further load of two tons is added.

$E_{\text{copper}} = 1.10 \times 10^6 \text{ kg/cm}^2$ and $E_{\text{steel}} = 2.06 \times 10^6 \text{ kg/cm}^2$. Neglect any possibility of lateral buckling. 4



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SECOND SEMESTER

B.E. (BT)

MID SEMESTER EXAMINATION **MARCH 2005**

BT-115 ENGINEERING MATHEMATICS

Time: 1 Hour 30 Minutes

Max. Marks : 20

Note : Answer **ALL** questions.
Choosing any **TWO** parts from each.
Assume suitable missing data, if any.

- 1[a] Solve $(D^2 + D)y = \frac{1}{1 + e^x}$
- [b] Integrate in series the equation $x^2 y'' + xy' + (x^2 - 4)y = 0$
- [c] Find the value of $\sum_{n=1}^{\infty} \frac{1}{n^2}$ using Fourier series. (6)
- 2[a] State and prove convolution Theorem.
- [b] Show that $L^{-1}\left[e^{-\sqrt{s}}\right] = \frac{1}{2\pi\sqrt{\pi t}} e^{-1/4t}$
- [c] For what values of z , the equation $z = \sinh u \cos v + i \cosh u \sin v$, $w = u + iv$, ceases to be analytic. (7)
- 3[a] Discuss the transformation $\frac{1}{z}$.
- [b] Show that the transformation $w = z^2$ transforms the circle $|z - a| = c$ in the z -plane
- (i) to a limaçon in the w -plane, if $a \neq c$
- (ii) to a cardioid in the w -plane, if $a = c$.
- [c] If $f(z)$ is analytic then show that
- $$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^p = p^2 |f(z)|^{p-2} |f'(z)|^2 \quad (7)$$