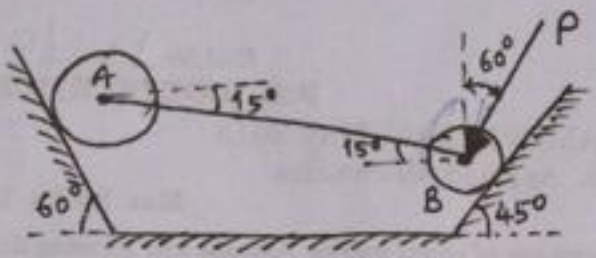

Fig 1

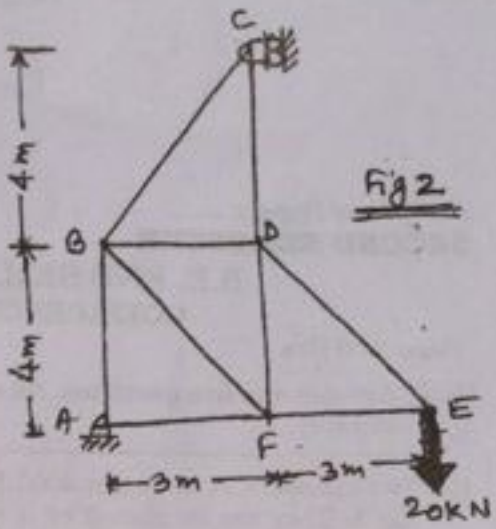

Fig 2

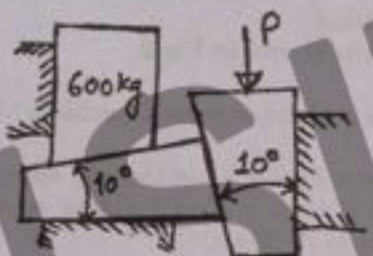

Fig 3

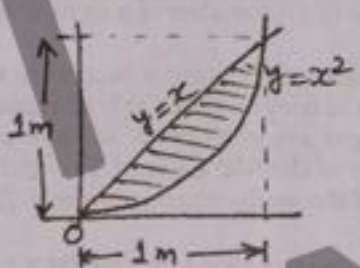

Fig 4

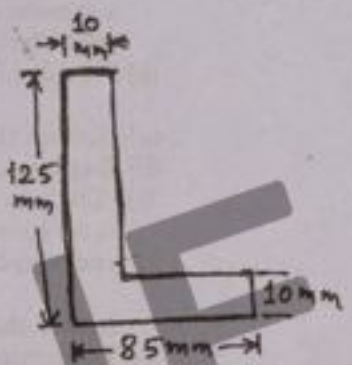

Fig 5

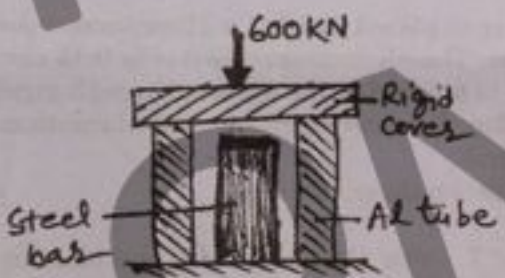

Fig.6

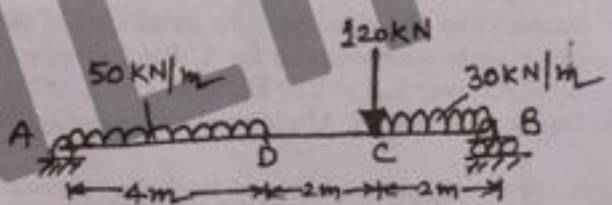

Fig.7

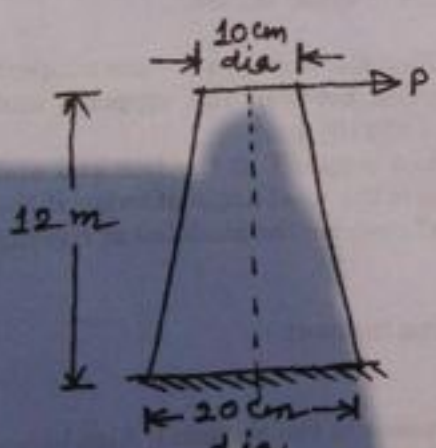

Fig.8

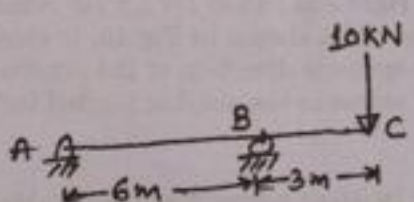

Fig. 9

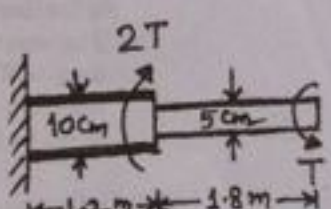

Fig 10

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Roll No. 12M/EC112

SECOND SEMESTER **B.E. (COE/ECE/ICE)**

B.E. END SEM. EXAMINATION, May 2013

COE/ECE/ICE-112: Applied Mechanics

Time: 3:00 Hrs. Max. Marks: 70

Note: Attempt any five questions. All questions are of equal marks. Assume any missing data suitably.

1(a) Two cylinders, A of weight 4000 N and B of 2000 N rest on smooth inclines as shown in fig 1. They are connected by a bar of negligible weight hinged to each cylinder at its geometric centre by smooth pins. Find the force P to be applied as shown in the figure such that it will hold the system in the given position.

(b) Find the forces in all member of a system of truss as shown in Fig 2.

2 (a) Discuss the rules for selecting a section in section method to solve a problem of truss.

(b) Explain angle of friction and angle of repose.

(c) The two wedges are positioned, so that a downward force P on the one edge will result in an elevation of the 600 Kg load.The coefficient of friction for all sliding surfaces is 0.2, and weights of the wedges are negligible. Determine P. (Fig 3)

3(a) Locate the centroid of area bounded by $y = x$ and $y = x^2$ as shown in Fig 4.

(b) Determine the moment of inertia of the L-section shown in Fig 5 about its centroidal axes parallel to x and y axis. Also find out the polar moment of inertia.

4(a) A solid steel bar 500 mm long and 70 mm diameter is placed inside an aluminium tube having 75 mm inside and 100 mm outside diameter. The aluminium cylinder is 0.15 mm longer than the steel bar. An axial load of 600 kN is applied to the system through rigid cover plate as shown in fig 6. Find stresses developed in the steel bar and aluminium tube. Assume E_{steel}= 210 kN/mm² and E_{al}= 70 kN/mm²

(b) Define E, G and K. Also establish a relationship between these modulus.

5(a) A simply supported beam is loaded as shown in Fig 7. Draw the shear force and bending moment diagrams. Also find the value of maximum bending moment.

(b) A cantilever wooden mast 12 m high tapers linearly from 20 cm diameter at the base to 10 cm diameter at the top as shown in Fig 8 . If the Ultimate strength of the material of the mast is 35 MN/m², Calculate the magnitude of the load to cause failure.

6(a) An overhanging beam ABC is loaded as shown in Fig 9. Find the slopes over each support and right end. Find also the maximum upward deflection between the supports and deflection at the right end. Take E= 2 x 10^5 N/mm² and I= 5x10^8 mm⁴.

(b) The stepped steel shaft shown in Fig 10, is subjected to a torque T at the free end and torque 2T in the opposite direction at the junction. What is the total angle of twist, if the maximum shear stress in the shaft is limited to 70 MPa? Assume the modulus of rigidity to be 84 GPa.

7(a) Define equivalent twisting moment and equivalent bending moment.

(b) The stress at a point in a stressed material is given by:

σ_x= 20 MPa σ_y = 10 MPa and τ_{xy} = 25MPa.

Determine the direction and magnitude of principal stresses in the material. Also locate the planes of maximum shearing stress and calculate the normal and shearing stress on these planes. Verify the answers with the help of Mohr's circle method also.

SECTION – B

Note: Answer **any five**, all questions carry equal marks.

1. What are Zeolites? How do they function in removing the hardness of water? What are the merits of ion exchange resins?

2. Explain the stages of fabrication of solar cells from sand.

3. What are refractories and how are they classified? Describe the following properties of refractories:
   (a) Refractoriness and seger cone number
   (b) R.U.L. (c) Porosity
   (d) Spalling resistance (e) Ceramics

4. Write short notes on any two of the following:
   (a) Voltage (b) Capacity
   (c) Throwing power of electroplating bath
   (d) Ceramics (e) Priming and foaming in boilers

5. What are the dielectric properties which are important to determine the suitability of insulating materials?

   OR

   Write short notes on different types of insulators.

6. A water sample on analysis gives the following data:
   Ca^{2+} : 20 ppm CO_2^- : 30 ppm
   Mg^{2+} : 25 ppm HCO_3 : 150 ppm
   K^+ : 10 ppm
   Calculate the lime (87%) pure and soda (91% pure), required to soften 1 million litres of water sample.

7. Define electroplating. Explain the physical properties of a bath.

   OR

   Describe the main characteristics of the materials used for various components of a battery.

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Roll No.....

SECOND SEMESTER **B.E. (ECE/EE)**

B.E. END SEM. THEORY EXAM. (May-June 2013)

EC/EE-115 : ELECTRICAL ENGG. MATERIALS

Time: 3:00 Hrs. Max. Marks: 70

Note: Use separate answer sheet for Section-A and Section-B

SECTION – A

Note: Attempt **any three** questions.
Symbols have their usual meanings.

1. [a] Determine the Miller indices of a plane that makes an intercept at $2A^0$, $3A^0$ & $4A^0$ on the coordinate axis respectively of an orthorhombic crystal with a:b:c=4:3:2. [6]

[b] What is a Bravis Lattice? Calculate the packing fraction of diamond structure. [6]

2. [a] Describe Drude models of free electrons for metal. Deduce Wiedmann-Franz equation. Mention its limitation. [6]

[b] What is Zero Point Energy? Sketch and explain the curves of (i) Energy, E versus Fermi function, F(E) (ii) Energy, E versus electron density n(E) and (iii) Energy, E versus density of state function S(E). [6]

3. [a] Explain the following terms:

i) Bohr Magneton
ii) Magnetic Domain
iii) Type-I & Type-II Superconductors. [6]

[b] What is Meissner effect? Derive second London equation. Justify Meissner effect. [6]

4. Write notes on **any two** of the following:

[a] Langevin theory of paramagnetism
[b] Band formation in solids
[c] Hall effect
[d] Einstein's Diffusion equation. [5½+5½]

length l and of negligible
string at B. Find the angle θ, for wh
conditions.

SECTION – B

Note: Answer **any five**, all questions carry equal marks.

1. What are Zeolites? How do they function in removing the hardness of water? What are the merits of ion exchange resins?

2. Explain the stages of fabrication of solar cells from sand.

3. What are refractories and how are they classified? Describe the following properties of refractories:
   (a) Refractoriness and seger cone number
   (b) R.U.L. (c) Porosity
   (d) Spalling resistance (e) Ceramics

4. Write short notes on any two of the following:
   (a) Voltage (b) Capacity
   (c) Throwing power of electroplating bath
   (d) Ceramics (e) Priming and foaming in boilers

5. What are the dielectric properties which are important to determine the suitability of insulating materials?

   OR

   Write short notes on different types of insulators.

6. A water sample on analysis gives the following data:

   Ca^{2+} : 20 ppm CO_2^- : 30 ppm
   Mg^{2+} : 25 ppm HCO_3 : 150 ppm
   K^+ : 10 ppm

   Calculate the lime (87%) pure and soda (91% pure), required to soften 1 milion litres of water sample.

7. Define electroplating. Explain the physical properties of a bath.

   OR

   Describe the main characteristics of the materials used for various components of a battery.

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Roll Number.....

Total No. of Pages: 1

SECOND SEMESTER, BE (EC/CO/IC)
END SEMESTER EXAMINATION, MAY - 2013
EC/CO/IC - 113: Mathematics - II

Max. Marks:70

Time: 3:00 hrs.

Attempt any Five questions. All Questions carry equal marks.

1. (a) Divide $2U$ into three parts such that the continued product of the first, square of the second and cube of the third may be maximum.

   (b) Solve the simultaneous differential equations $\frac{dx}{dt}+4x+3y=t$, $\frac{dy}{dt}+2x+5y=e^t$.

2. (a) If $z=(x+y)\{1+\phi(y/x)\}$, prove that $x\left(\frac{\partial^2 z}{\partial x^2}-\frac{\partial^2 z}{\partial x\,\partial y}\right)=y\left(\frac{\partial^2 z}{\partial y^2}-\frac{\partial^2 z}{\partial y\,\partial x}\right)$.

   (b) Find eigenvalues and eigenvectors of the matrix $A=\begin{pmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{pmatrix}$.

3. (a) Find the value of λ for which the following equations are consistent
   $(\lambda-1)x+(3\lambda+1)y+2\lambda z=0$,
   $(\lambda-1)x+(4\lambda-2)y+(\lambda+3)z=0$,
   $2x+(3\lambda+1)y+3(\lambda-1)z=0$.

   (b) Evaluate (i) $\mathcal{L}^{-1}\left\{\frac{4s^2+3s}{(s-1)(s^2+2s-5)}\right\}$, (ii) $\mathcal{L}\left\{\int_0^t \cos^2 u\,du\right\}$.

4. (a) Find the volume bounded by the cylinder $x^2+y^2=4$ and the plane $y+z=4$, and $z=0$.

   (b) Solve the differential equation $\frac{d^3y}{dx^3}+2\frac{d^2y}{dx^2}+\frac{dy}{dx}=x^2e^{2x}+\sin^2 x$.

5. (a) Evaluate the integral $\int_0^a\int_y^{a+\sqrt{a^2-y^2}}\frac{dx\,dy}{(4a^2+x^2+y^2)^2}$.

   (b) State and prove convolution theorem and applying the same find the inverse Laplace transform of the function $\frac{1}{(s+1)(s+9)^2}$.

6. (a) Find the series solution of the differential equation $4x\frac{d^2y}{dx^2}+2\frac{dy}{dx}+y=0$ about the point $x=0$.

   (b) Using Laplace transform solve $\frac{d^2y}{dt^2}+4\frac{dy}{dt}+4y=6e^{-t}$, $y(0)=-2$, $\frac{dy}{dt})(0)=8$.

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Total No. of Page(s): 2

SECOND SEMESTER Roll No.: 12WUEC112

B.E. (EC/COE/ICE)

END SEM. EXAMINATION, May- 2013

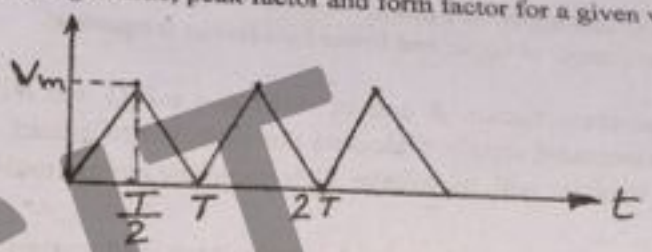
EC/COE/ICE -111: Principle of Electrical Engineering

Time: 3:00 Hrs. Max. Marks: 70

Note: Attempt any five questions. Assume any missing data suitably.

Q.1 (a) Distinguish between conductors, semiconductors and insulators with examples. Show that if α_1 is the resistance temperature coefficient of a conductor at t_1 °C then resistance temperature coefficient at t_2 °C is given by $\frac{1}{\frac{1}{\alpha_1}+(t_2-t_1)}$. (7)

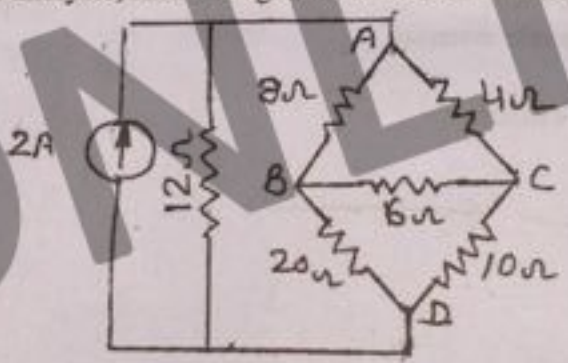
(b) Find the rms value, average value, peak factor and form factor for a given waveform below. (7)



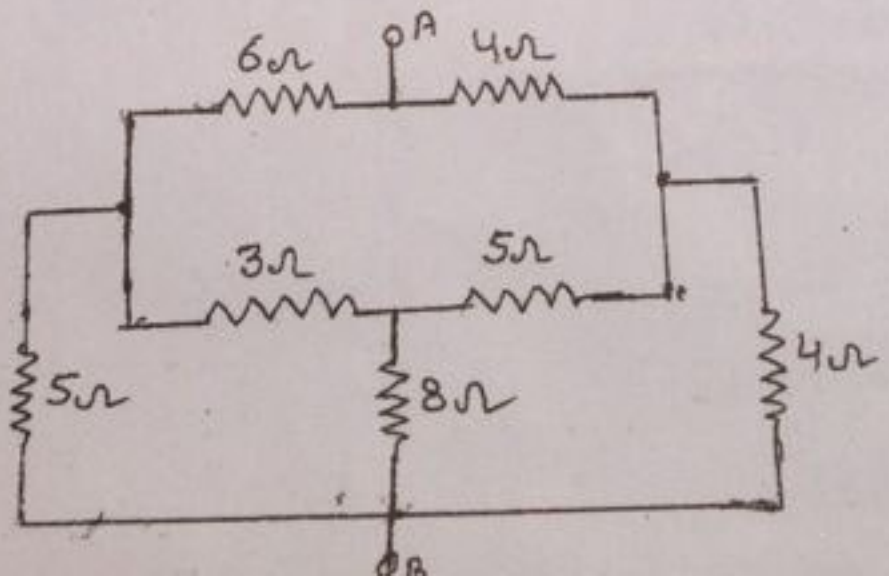
Q.2 (a) The core of an electromagnet is made of an iron rod 10 mm diameter, bent into a circle of mean diameter 100 mm, and radial gap of 1mm is left between ends of the rod. Calculate the direct current needed in a coil of 2000 turns uniformly spaced around the core to produce a magnetic flux of 0.2 mWb in the air gap. The relative permeability of iron is 150 and magnetic leakage factor is 1.2. (7)

(b) Discuss various torque acting on the moving mechanism of the instruments. How are these obtained and what are their roles in the operation of instruments? (7)

Q.3 (a) Using nodal analysis, find voltage across the terminal *C* and *D* of the circuit given below. (7)



(b) For the circuit shown below, determine the resistance between point A and B. (7)



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Roll No. 194/EC/12

BE(ECE)

END SEMESTER EXAMINATION-MAY 2013

ECE-114:PHYSICS-II

Time: 3 hrs

Max Marks:70

Note: Attempt any five questions

All questions carry equal marks

Assume suitable missing data, if any

Q1. a) State Gauss's Law in Electrostatics? Write its Differential form. (3)

b)Find the electric field due to a non-conducting infinite plane sheet of charge with uniform charge density ρ_s C/m^2 using Gauss's Law. (4)

c) Using Gauss's Law in integral form, obtain the electric field due to following charge distribution in spherical coordinates:

$\rho(r,\theta,\varphi) = \rho_0(1-r^2/a^2)$ $0<r<a$

$= 0$ $a<r<\infty$ (7)

Q2. A) Using Langevin's Theory, Show that orientational polarization is inversely proportional to the absolut temperature & directly proportional to the applied field E. (5)

b) Derive Claussius-Mossotti relationship to find dielectric constant of a material due to the polarizability of atoms comprising it. (5)

c) Using Ampere Circuital law in integral form, find H everywhere due to following volume current density in cylindrical coordinates

$J=0$ $0<r<a$

$=J_0 l_z$ $a<r<b$

$=0$ $b<r<\infty$ (4)

Q3. A) Show that the de Broglie wavelength of a particle of rest mass m_0 & Kinetic energy K is given by: (4)

$$\lambda = \frac{hc}{\sqrt{K(K+2m_0c^2)}}$$

b) An electron has a de Broglie wavelength of 2 pm($2X10^{-12}$ m). Find its Kinetic Energy, phase & group velocity of its de Broglie waves. (6)

c) Show that the phase velocity of the de Broglie waves of a particle of rest mass m_0 & de Broglie wavelength λ is given by (4)

$$v_p = c\sqrt{\left(1 + \left(\frac{m_0 c\lambda}{h}\right)^2\right)}$$

Q4. A) Derive energy eigen values & normalized wavefuction of a particle trapped in a box of length L with infinitely hard walls. (6)

b) Find the probability that a particle in a box L wide can be found between x=0 & x= L/n when it is in n^{th} state. (4)

c) Find the expectation value of position & momentum of a particle whose normalized wavefunction is (4)

$$\psi(x) = Ne^{-\left(\frac{x^2}{2a^2}\right)+ikx}$$

Q5. A) Stating assumptions for distribution of bosons in different eigen states, derive Bose-Einstein distribution law for distribution of n_i particles in g_i states. (5)

b) Using Maxwell Boltzmann distribution law, show that average molecular energy for an ideal gas is independent of molecular mass & is equal to 3kT/2 where k= Boltzmann constant. (5)

c) What is the occupation number at room temp. of an electron state lying a) 0.1 eV above the Fermi level, and b) 0.1 eV below the Fermi level? Also sketch the Fermi Function in the neighbourhood of Fermi level for the given temperature. (4)

Q6. A) Derive semi empirical formula for Binding energy using Liquid Drop Model. State corrections to the formula taking into account Assymetry energy & Pairing Energy. (5)

b) What is the limitation on the fuel that can be used in a reactor whose moderator is ordinary water? Why is the situation different if moderator is heavy water? Also explain why Cadmium rods are used as controlling rods in the reactor. (5)

c) Isobars are nuclides that have same mass number A. Derive a formula for the atomic numbe of the most stable isobar of a given A & use it to find the most stable isobar of A= 25. (4)

Q7. Write short notes on any two of the following: (7+7)

a) Application of Quantum Mechanics to Black Body radiation
b) Growth & Decay of current in R-L & R-C circuits
c) Inconsistencies in Ampere Circuital law & Maxwell's correction.
d) Capture cross section for Nuclear Reactions.