ENGINEERING MATHEMATICS
MODULE 1

SHORT ANSWER TYPE

1. Solve $(3x^2 + 6xy^2) dx + (6x^2y + 4y^3)dy = 0$. (2017 MAY)
2. Solve $\sec^2y (dy/dx) + 2x\tan y = x^3$. (2017 MAY)
3. Solve $+ 2 + 3x = \sin t$. (2017 MAY)
4. Solve $(y^2 - x^2)dx + 2xydy = 0$. (2016 DEC) 5.Solve$(D^2 + 4)y = 0$. (2016DEC)
5. Define Linear differential equation. Write its standard form and hence the integrating factor. (2016 DEC)
6. Solve $d^2y/dx^2 + 25y = \cos 4x$. (2016 MAY)
7. Solve $x^2{}^{dy/dx} + 4x{}^{dy/dx} + 2y = e^s$. (2016 MAY)
8. .Solve $(2x\cos(y)+3x^2y)dx+(x^3-x^2\sin(y)-y)dy=0$
9. .Solve $\sec^2(y)dy/dx+2x\tan(y)=x^3$
10. $x^2d^2y/dx^2+4xdy/dx+2y=0$
11. Solve $xy(1+xy^2)dy/dx=1$
12. Solve $(D^3+1)y=0$

LONG ANSWER TYPE

1. (a) Solve $d^2y/dx^2 + 4x = 0$. (2017 MAY)
   (b) Solve $d^2y/dx^2+2dy/dx+ y = xe \sin x$. (2017 MAY)
   (c) Solve $x^2(dy/dx)+ 2x - 20y = (x + 1)^2$. (2017 MAY)
2. (a) Solve the simultaneous equation
      $dx/dt-x+dy/dt=2t+1$
      $2(dx/dt)+x+2(dy/dt)=0$
   (b) A condenser of capacity C discharged through inductance L and resistance R in series and the charge q at time t satisfies the equation
      $L(d^2q/dt^{2)} + R(dq/dt)+q = 0$, Where L=1 henry, R=400 ohms, C=16 x10^6
      Find q in terms of t. (2017 MAY)
3. Solve
   (a).$(1 + x + xy^2)dy + (y + y^3)dx = 0$
   (b).$(D^3 - D^2 + 4D - 4)y = e^s$
4. Solve   (DEC 2016)
      (a).$(x^2D^2 - 3xD + 4)y = x^3$
      (b).$ds/dt= 2y-1$, $dy/dt=1+2x$

5. (a) Solve $dy/ds=(y-s)/(y-s-2)$
   (b) The slope at any point (x,y) of a curve is 1+ . If the curve passes through (1,1) find the equation of curve .
      (c) Solve $4y^2p^2+2pxy (3+1)+3x^3=0$ .Where p=dy/dx

6. (a) Solve$+ 2y +e^x(3\sin 2x +2\cos 2x)$. (2016 MAY)
   (b) Solve $4x^2(d^2y/dx^2) - 4x(dy/dx) +3y=0$
. (c) Solve simultaneous equations $dy/dt+5y-2x= t$; $ds/dt+ 2y + x =0$
7.(a) Solve $d^2y/dx^2+y=e^{2x}+x\cos(x)$

(b) Solve $x^2d^2y/dx^2+2xdy/dx-20y=x^4$

8. (a) Solve $x^2d^2y/dx^2-5xdy/dx+8y=2x^3$

    (b) Solve the system of equations $dx/dt-y=t, dy/dx+x=t^3$

MODULE 2

SHORT ANSWER TYPE

1. Test the convergence of the series expansion of $tan^{-1}x$
.(2017   MAY)

MODULE 3

SHORT ANSWER TYPE

1. If $x^y + y^s = c$, find dy/dx .(2017 MAY)

2. Show that $U = e^s \sin y$, $V = e^s \cos y$ are functionally independent. (2017 MAY)

3. If $u = x^2tan^{-1}(y/x) - y^2tan^{-1}(x/y)$, then prove that $d^2u/dx^2= (x^2 - y^2)/(x^2 + y^2)$
(2016 DEC)

4. If $x = u(1 - v)$ and $y = uv$ find $6(s,y)$ and $6(u,v)$ also verify
that the product of jacobians is 1   (2016 DEC)

5. Find $6u^2 /6s6y6z$, I fu $= e^{s+y+z}$.   (2016 MAY)

6. Find the Jacobian $\partial(s,v)/\partial(u,v)$ of u = xsiny; v = y sin x. (2016 MAY)

7. If $u=e^{xyz}$, find $\partial^3u/\partial x\partial y\partial z$.

8. The period of oscillation T of a simple pendulum of length l is given   by $T=2\pi$ (l/g) where g is a constant. Find the approximate error in the calculated value of T corresponding to an error of 2% in the measured value of T.

9. If $u = tan^{-1} (x^3+y^{3)}/(x-y)$ prove that $x\partial u/\partial x + \partial u/\partial y = \sin2u$.

10. Show that u = (x+y)/(x-y), v= $xy/(x-y)^2$ are functionally dependent.

LONG ANSWER TYPE

1.(a).Show that if $u = sin^{-1}(s+2y+2z)/ (s^2+y^2+z^2)$ then $6u/6sx+6u/6y\ y+6u/6z\ z$ 3 tan u = 0.

    (b) If=y/z+z/s+s/y, show that $6u/6sx+6u/6y\ y+6u/6z\ z=0$.

    (c) . The diameter and height of a straight circular cylinder are measured to be 5 and 8 inches respectively, if each of these dimensions are in error 0.1 inch. Find the relative percentage error in volume of the cylinder.
(2017 MAY)

2.a) if $u = tan^{-1}(x^3+y^3)/(x-y)$ prove that $x\partial u/\partial x + y\partial u/\partial y$ $= \sin2u$.

  (b) If x = rsinΘcosφ, z= rcosΘ prove that $\partial(x, y, z)/\partial(r, Θ, φ) =r^2sinΘ$.

3. (a) Find the maximum and minimum values of
    $f(x, y)=x^3+y^3-3x-12y+20$

  (b) If u=log (tanx+tany+tanz) show that
    $\sin2x\ \partial u/\partial x+\sin2y\ \partial u/\partial y+\sin2z\ \partial u/\partial z=2$.

MODULE 4

SHORT ANSWER TYPE

1) Evaluate $\iint (x^2 + y^2)dxdy$ where s is the region in the which each of x, y >= 0 and x+y<=1.

2) Find the length of the arc of the curve $y^2= x^3$ extending from origin to the point (1, 1).

3)Find the area of the curve r = 2acosθ.

4)Change the order of integration in the integral and sketch the region $\int_0^a \int_{x^2/a}^{2a-x} f(x,y)dxdy$.

LONG ANSWER TYPE

1) (a) Find the volume of the solid generated by revolving the asteroid $x=a\cos^3 t$, $y = a\sin^3 t$ about x axis.

(b)Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \dfrac{dzdydx}{\sqrt{1-x^2-y^2-z^2}}$

2) (a)Evaluate $\iint r^3 drd\theta$ over the region bounded between the circles r = 2cosθ and r = 4cosθ.

(b) Change the order of integration in $\int_0^1 \int_{x^2}^x (2x^2+y)dydx$ and hence evaluate it.

3) (a) find the volume of the solid generated by revolving $x^{2/3} + y^{2/3} = a^{2/3}$ about the x-axis.

(b)Evaluate $\iint_R \dfrac{e^{-y}}{y} dxdy$ by choosing order of integration suitably given that, region   R, is bounded by the line x = 0x=y,and y=∞.

4) (a) Find the areas of the crescent bounded by r = $\sqrt{3}$ and r = 2cosθ.

(b) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x \, dxdzdy$.

COMPUTER PROGRAMMING

MODULE 1
SHORT ANSWER
1. Write an algorithm or flow chart to find the sum of any N numbers. [2] (2016)2.
2. What are the applications of computer? [5] (2015)
3. Explain the terms I) Compilerii) Interpreter? [5] (2015)
4. What is the function of linker and loader? [5] (2015)

LONG ANSWER
1. Explain the working of a digital computer? [7] (2015)
2. Explain different categories of software? [7] (2015)
3. Explain programming process? [8] (2015)
4. Distinguish between hardware and software of a computer system? [8] (2015)
5. Explain the types and generations of programming languages? [10] (2015)
6. Describe the basic building blocks of a digital computer. [10] (2016)
7. Explain the 3 basic tools with examples. [10] (2016)

MODULE 2
SHORT ANSWER
1. Write a C program to count number of characters in a string. [2](2016)
2. What is the output of the following program? [2](2016)
```
#include<stdio.h>
Void main()
{
int a=10,b=6; int c=a*b++;
printf("%d%d%d",a,b,c);
}
```
3. Write a program to calculate the average of set of N numbers? [5]
4. Distinguish between i)BREAK and ii)CONTINUE?[5](2015)
5. What is mean by enumerated data types? Give its application also. [5] (2015)
I) Circle ii) Rectangle iii)Triangle iv)Square
6. Write a program to check whether a given number is an Armstrong number.[5](2016)
7. Implement calculator to perform addition, subtraction and multiplication for a given set of numbers using menu driven C program.[5](2016)

LONG ANSWER
1. Write a algorithm and program to compute simple interest where the principle, number of years and rate of interest are given.[7] (2015)
2. Write a single program to compute the area of the following.[8] (2015)
3. Compare feature of Pretest and Posttest statements. Explain with example program.[10](2016 UQ)

MODULE 3
SHORT ANSWER

1."Argument can be accessed with in main () declaration as any other argument to a function ".Comment on this statement.[2](2016)   2. Briefly explain the difference between structure and union.[2](2016)

3.What are library functions? Explain with an example.(What is Library function used for random number generation? (2016)

4.What is a dynamic array? How is it created? [5] (2015)

5.Describe two way of passing parameters of function with examples.[5](2015)

6.Write a recursive function for finding the value of nth Fibonacci number.[5](2016)

7.Create a structure for storing Complex numbers (Complex number consist of real part and imaginary part).Write a program to find the sum of two complex numbers .[5](2016)

LONG ANSWER

1.Compare Linear searching and Binary searching .Write a program search for an element in an array using Binary searching algorithm. [10](2016)

2.Write an algorithm and a C program to print the Fibonacci series up to 100.[10](2015)

3.Write a C program to read and store register number ,name, mark of physics, chemistry, mathematics of a set of 100 students using structure. Display the progress card f each student which contains register number, name , total mark ,percentage and grade of each student. (91% - 100% A grade , 80% -90% B grade and below 80 - C grade).[15] (2015)

MODULE 4

SHORT ANSWER

1.What is the output of the following program?
```
#include<stdio.h>
main()
{ int *p;
*p=5;
Printf(%d,*p);}
```
justify your answer with necessary explanation .[2](2016)

2.Explain 'fseek' with an example program .[2](2016)

3.What are the various file handling operation ? [4](2016)

4.What are the advantages of using pointers? [5] (2015) 5.Write a program to write N numbers to a file. [5] (2015)

LONG ANSWER

1.Write a C program that counts the number of characters and number of lines in a file,[6](2016)

ENGINEERING PHYSICS

MODULE – 1
PART A
1. Write a brief note on properties of laser.

2. Discuss the principle of Holography with a diagram.
3. What are the different types of dispersion in optical fibers?
4. The velocity of light in the core of silica fiber is 2×10^8 m/s and the critical angle of core cladding interface is 60^0. Calculate
a. The refractive indices of core and cladding
b. The numerical aperture of the fiber.   (2017)
5. A pulsed laser is constructed with a ruby crystal as the active material.
The ruby rod contains typically a total of 3×10^{19} Cr3+ ions. If the laser emits light at $6943A^0$ wavelength, find
a. The energy of emitted photon in eV
b. The total energy available per laser pulse (assume total population inversion)
6. For an ordinary source, the coherence time is 10-10 sec. Obtain the degree of non-monochromaticity for $\lambda 0 = 5400A^0$? (2016)
7. A signal of 1000mW is injected into a fiber. The out coming signal from the other end is 40mW. What is the loss in dB? (2016)
8. Explain the term 'Population inversion' (2015)
9. Distinguish between step index fiber and graded index fiber. (2015)
10. Calculate the number of photons emitted per second at a wavelength 632.8nm by He-Ne laser of 3mW power. (2015)
12. The numerical aperture of an optical fiber is 0.39µ. If the difference in the refractive indices of the material of its core and the cladding is 0.05, calculate the refractive index of material of the core.   (2015)
13. Why are two independent sources incoherent?
14. What are the different losses in optical fibres?
15.   Differentiate between normal light and laser light?
16.   How is the working principle of optical fibres based on total internal reflection?

PART B
1. i) A three level laser light emits a light of wavelength $5500A^0$. What will be the ratio of population of upper energy level (E2) to the lower energy level (E1) if the optical pumping mechanism is shut off?
                              (Assume T = 300K) (4 mark)
ii) What is the fundamental principle of a hologram? How it is produced and how is the image constructed from it? (6 mark)(2016)
2. The core of fiber has refractive index 1.5 and cladding has 1.48. Find the critical angle, the fractional refractive index,

acceptance angle and numerical aperture? (4 mark)

ii) Explain in details the difference between single mode step index and multimode graded index fiber. (6 mark)(2016)

3. What do you mean by Fermi energy level in a semiconductor? How does the position of Fermi level affect the working of semiconductor laser? Discuss the construction and working of semiconductor laser. (8 mark)(2017)

4. What are optical fibres? Discuss different types of fibres with appropriate diagrams and applications.(8 mark)(2017)

5.Explain the principle, construction and working of a He-Ne laser, with the help of diagrams.(8 mark)(2015)

6.Derive expressions for the numerical aperture, acceptance angle and fractional index charge of an optical fiber(8 mark)(2015)

7. (a) What is population inversion? Describe any four methods of achieving population inversion.

(b) Calculate the number of photons emmited per second at a wavelength 624nm by He-Ne laser of 4mW.

8.(a) What you understand by holography? Explain its working and mention any four applications of holography.

(b) The coherence length of sodium light is 2.945×10^{-2} m and its wavelength is $5890A^{\circ}$. Calculate the frequency and the coherence time.

9.(a) What are optical fibres? Discuss the effect of dispersion on their performance.

(b) The NA of an optical fibre with cladding refractive index 1.59 is 0.2.Calculate the acceptance angle for fibre in water.

10.(a) Derive an expression for numerical aperture of an optical fiber.

(b) Calculate the refractive indices of core and cladding of an optical fibre with numerical aperture 0.36 and their fractional change of refractive indices being 0.04.

MODULE - 2

PART A

1.What do you mean by packing factor? Calculate packing factor for simple cubic, BCC and FCC structures.(2017)

2.Name the different types of liquid crystals. Describe their features(2017)

3.What do you mean by pseudo elasticity in shape memory alloys(May 2017)

4.Draw the planes (100) and (010). (2016)

5.Calculate the distance between two atoms of diamond structure, if lattice constant of the structure is 5 A0. (2016)

6.Mention any four applications of metallic glasses. (2016)

7.Define coordination number and packing factor of a crystal. (2015)

8.Explain magnetic shape memory effect (2015)

9.Chromium has BCC structure. Its atomic radius is 0.1249nm.

Calculate the free volume/unit cell   (2015)
10.Define coordination number and packing factor of a crystal.
11.Explain magnetic shape memory effect.
12.Show that the atomic packing factor of SC crystal is 0.52.
13.What is meant by one way shape memory alloy?

PART B

1..i)A monochromatic beam of X-rays of wavelength 1.24 A0 is
reflected by cubic crystal of KCl. Determine the interplanar
distance for (100) and (111) planes. (density of KCl = 1980 kg/m3
and molecular weight = 74.5)   (4 mark)
ii) What is the concept of miller indices? Derive the formula for the
distance between two adjacent planes of a simple cubic lattice
(6mark)(2016)
2 .i) From the following data calculate the wavelength of neutron
beam and its speed. Spacing between successive planes is 3.48A0,
glancing angle is 300 and the order of Bragg reflection=1(4 mark)
ii) Explain shape memory effect   (6mark)(2016)

3.i)Derive Bragg's law. Discuss the crystal structure analysis
using Bragg's X-ray spectroscopy.   (7 mark)
ii) Lead is face centred cubic with atomic radius of 1.746A0.
Find the spacing of
a)(200) planes
b)(220) planes

4.i)Describe the construction and working of the crystal system
display system with a neat diagram. What are the merits and demerits of LCD?
                                          (7 mark)
ii)What are metallic glasses? Write a note on the properties of metallic glasses
(3 mark)(2017)
5.i)What are Miller indices? How are they obtained? (5 mark)
ii)Derive Bragg's law for X-diffraction.
6.Explain the construction and working of liquid crystal displays
(8 mark)(2015)
7.(a) What are miller indices? How will you determine the Miller indices of a
given plane? What are the distinct features of Miller indices?
   (b) The density of a rock salt crystal is 2.16×10^3 Kg/m^3. The interplanar
spacing d_{100} is 2.82 A$^\circ$. Determine the molecular weight of rock salt crystal.
8..(a) Define metallic glasses. Explain how metallic glasses are prepared and
how they are different from their crystalline counterparts.
   (b) In a simple cubic,find the ratio of inter planar spacing of (1 1 0) and(1 1 1)
planes.
9.(a) Calculate inter planar spacing of a set of Miller Indices in terms of lattice
parameters.
   (b) Sketch the following planes of a cubic unit cell:
       (001),(120),(111),(011)

10.(a) With a neat diagram explain liquid crystal display system.

  (b) Mention any four application of SMA.

MODULE 3

PART A

1. Write a brief note on the applications of nanomaterials. (2017)

2. Discuss the classification of nanomaterials.

3. The density of gold is $19.3 \times 10^3 kg/m^3$ in a frame S which is at rest. Calculate its density for an observer in a frame SI, which is moving along X-axis with a speed of 0.9c (2017)

4. The critical temperature for mercury with isotopic mass 199.5 is 4.185K. What will be its critical temperature when its isotopic mass is increased to 203.4? (2016)

5. What are nano composites?

6. Write a note on flux quantization.

7. What are the two postulates of special theory of relativity?

8. How are the nanoparticles prepared employing the top down methods?

9. Calculate the energy equivalent to 1 atomic mass unit in meV.

10. Why is uncertainity principle important for microscopic particles

11. What are nanocomposites? (2015)

12. Explain Meissner effect.

13. What are the two postulates of special theory of relativity? (2015)

14. Mention any four applications of superconductors. (2015)

15. A Josephson junction having a voltage of 0.85µ V across its terminals, then calculate the frequency of the alternating current. (2015)

16. Two particles come towards each other with speed 0.7c with respect to laboratory frame of reference. What is their relative speed?(2015)

PART B

1)(a) What are the different types of superconductors? Explain in detail.

  (b) The critical values of magnetic fields are 2×10^5 A/m and 10^5 A/m for niobium at 0 K and 8 K respectively. Determine its critical temperature.

2)(a) State and explain the fundamental postulates of special theory of relativity and derive Lorentz space time transformation equations on their basis.

  (b) In a laboratory, the life time of the particle moving with speed 2.8×10^8 m/sec is found to be 2×10^7 sec. Calculate the proper life time of the particle.

3)(a) Explain the terms Meissner effect,Isotope effect and Josephson effect in superconductivity.

  (b) A long superconducting wire produces a magnetic field of 205×10^3 A/m on its surface due to current through it at temperature $T < T_c$. Its critical magnetic field 0 K is 250×10^3 A/m, the critical temperature of material of wire is 10 K. Find the value of T.

4)(a) Derive Einstein's mass energy relation in relativistic theory.

  (b) When an electron moves with a velocity 0.7c calculate its kinetic energy using relativistic theory and classical theory.

5.i)Determine the transition temperature and critical field at 4.2K for a given specimen of superconductor if the critical fields are 1.41×10^5 and 4.205×10^5 amp/m at 1.41K and 12.9K respectively (4

mark)

ii)Explain the difference between type I and type II superconductors (6 mark)(2016)

6.i)Calculate the speed of electron which has the kinetic energy as 1.02 Mev. (rest mass energy of electron = 0.51 Mev)   (4 mark)

ii)Obtain Einstein's mass−energy relation.   (6 mark)(2016) 7.What are superconductors? Discuss the following terms.

i)Meissner effect

ii)   Critical current density iii)Isotope effect

iv)High temperature superconductors

8.Derive Einstein's mass-energy relationship. (8 mark)(2017)

9.Distinguish between soft and hard superconductors. (6 mark)(2015)

10.Derive Einstein's mass-energy relation. (8 mark)(2015)

MODULE - 4

PART A

1.What do you mean by a black body? Write Plank's formula for black body radiation.(2017)

2.What is reverberation? Describe how the reverberation time affects the sound level in a hall.   (2017)

3.What are nanocomposites?

4.The mean life of a meson is 2×10^{-8} sec. Calculate the mean life of a meson moving with a velocity 0.8c. (2016)

5.Calculate the frequency and wavelength of a photon of energy 75eV   (May 2016)

6.Calculate the total absorption coefficient of cinema hall, whose volume is 8000 m3 and reverberation time required is 1.8 sec. (2016)

7.Write a note on uncertainty principle.

8.Mention any four properties of ultrasonic waves   (2015)

9.What is massless particle?   (2015)

10.What is de-Broglie wavelength?   (2015)

11.Calculate the equivalent wavelength of an electron moving with velocity of 3x107m/s.   (2015)

12.Find the intensity level in dB of a sound intensity 3. 5×10^{2}(2015)

PART B

1.i. An electron is constrained to move in a one dimensional box of length 0.1mm. Find the first three Eigen values and the corresponding de-Brogli wavelengths. (3 mark)

ii.Derive the time dependent Schrodinger wave equation.   (7 mark)(2016)

2.i)A hall of floor is 15x30m2 along with height of 6m, in which 500 people occupy upholstered seat and the remainder sit on wooden chairs. Optimum reservation time for orchestral music is 1.36 sec

and absorption coefficient per person is 0.44. Calculate the coefficient of absorption to be provided by the walls, floor and ceiling when the hall is fully occupied. (4 mark)

ii)Describe the construction and working of a piezoelectric oscillator for the production of ultrasonic waves. (6 mark)(2016)

3.i)Derive the tie independent Schrodinger equation. What is the significance of wave function in quantum mechanics? (7 mark)

ii)State and explain Heisenberg's uncertainty principle.

Calculate the uncertainty in the position of an electron moving with a speed of 300m/s and if the uncertainty in its velocity is 0.001%. (3 mark)(2017)

4.(i) Describe the contruction, working, of ultra sonic generator based on piezo electronic effect.

ii)What is the reverberation time of a cubic hall if a false ceiling is made at half the height of the hall (at 7 feet). The absorption coefficient of the false ceiling material is 0.3 and that of wall and floor is 0.25. Analyzing your result, suggest actions needed (if any) to maintain acoustic efficiency. (1 foot = 0.3048m) (3 mark)(2017)

5.Derive time independent Schrodinger wave equation. (6 mark)(2015)

6.Explain the method of production of ultrasound using piezoelectric crystal, with a neat diagram.   (8 mark) (2015)

ENGINEERING CHEMISTRY

MODULE 1
SHORT TYPE ANSWER QUESTIONS
1. Explain different types of electronic transitions (dec 2015)
2. Differentiate schottkey defect and frenkel defects (dec 2015)
3. Explain fermi level in band theory (dec 2015)
4. O_2 and N_2 are microwave inactive where as CO gives as a microwave spectrum. Explain. Why?
5. What are schottkey defects. Illustrate with one example (MAY 2017)
6. Explain the principle of ESCA
7. Explain how FT-IR spectra is useful for molecular structure determination

LONG TYPE ANSWER QUESTIONS
1. Explain thermodynamics of adsorption and BET theorem (8 mark) (dec 2015)
2. Explain the working principle of NMR spectroscopy (5 mark)
3. what is Beer Lambert's law. Explain (5 mark)
4. Explain spin spin coupling in NMR spectroscopy and positive and negative shielding in NMR spectroscopy (6 mark) (dec 2016)
5. Explain different postulates in free electron theory (4 mark)
6. Explain Born Haeber cycle taking Nacl as an example (5 mark)
7. Explain the principle and importance of ESCA in chemical analysis (5 mark)
8. Explain the limitations of Beer-lambert's law (3 marks) (MAY 2017)
9. How can you differentiate intramolecular and inter molecular hydrogen bonding by FT-IR spectroscopy (3 marks)
10. Discuss about a method for the determination of surface area of porous solid samples
11. Explain spin-spin splitting using the 1H NMR spectrum 0f Et0H(3 mark)
12. Explain the m0lecular field the0ry 0f magnetic materials (4 marks)

MODULE 2
SHORT TYPE ANSWER QUESTIONS
1. Give any four applications of salt bridge (dec 2015)
2. What is the difference between molecularity and order of a reaction
3. What are the special features of a fuel cell (dec 2016)
4. Explain pseudo order reaction with example 5.Derive Nernst equation for electrode potential
6. What is a salt bridge? Explain its application scenario (MAY 2017)
7. Explain the principle of buffer action

LONG ANSWER TYPE QUESTIONS

1. What is solar cell? Explain the working of a solar cell (5 mark) (dec 2015)
2. Derive Nernst equation (5 mark)
3. Derive integral rate law equation for first order reaction (6 mark)
4. what is the working principle of concentration cell (4 mark)
5. What are the important factors controlling corossion (6 mark) (dec 2016)
6. What is the difference between primary and secondary cell? Explain the working of Lead-acid storage cell (4 mark)
7. Explain the brownsted-lwry and Lewisconcepts 0f acids and bases (4 mark) (MAY 2017)
8. Calculate the PH 0f a 1000ml s0luti0n 0f 0.25M acetic acid and 0.25M s0dium acetate per litre. What w0uld be the change in PH when 1ml 0f 1M HCl was added t0 this solution?$(K=1.8*10^{-5})$ (4 mark)

MODULE 3

SHORT TYPE ANSWER QUESTIONS

1. What is trauton's rule (dec 2015) 2. What is eutectic system? Explain
3. Give the four statements of 2nd law of thermodynamics
4. What is chemical potential? Explain (dec 2016)
5. Explain Nernst heat theorem (3 mark)
6. Derive the Kirchhoff's equation
7. What is chemical potential. Explain its importance in thermodynamic study of system?
8. What are excess functions and regular functions (MAY 2017)
9. What are electrolytic c0ncentrati0n cells? Calculate the emf 0f the f0ll0wing cell Cu(s)/Cu2+(0.2M)//Cu2+(2.0M)/Cu(s)

LONG ANSWER TYPE QUESTIONS

1. Derive the Gibb's Helmoltz equation (7 mark) (dec 2015)
2. Explain the phase rule taking one component water system as an example (8 mark)
3. Explain the phase rule taking two component pb-Ag system as an example (dec 2016)
4. Explain the phase diagram of Zn-Mg system (8 mark)

MODULE 4

SHORT TYPE ANSWER QUESTION

1. Give the method of preparation and important properties of PVC (dec 2015)
2. Write any four requistics of refractories
3. What is the difference between injection and extrusion moulding
4. Explain the importance of viscosity index in lubricants (dec 2016)
5. Give method of preparation and imporatant properties of polysterene
6. What is refractories?Give different types of refractories?
7. Write any four differences between thermoplastics and

thermosetts

8.Explain chemistry 0f vulcanisaition 0f rubber(MAY 2017)

LONG TYPE ANSWER QUESTIONS

1.Explain the Vulcanisation of rubber (5 mark) (dec 2015)

2.Differentiate thermoplastics and thermosetts (5 mark)

4.Explain viscosity index,flash and fire point,cloud and pour point,aniline point (10 mark)

5.Explain the importance of vulcanisation of rubber (5 mark) (dec 2016)

6.Differentiate injection moulding and extrusion moulding (5 mark)

7.Explain the Zeiggler-Nata cordinationpolymerisation technique (4 mark)

8.What are the chemical reactions involved in cement hardening (4 mark)

ENGINEERING GRAPHIC

MODULE 1

1.Construct a scale of RF 1/25, to show meters and decimeters and by a Vernier to read centimetres and long enough to measure up to 4 metres. Show a distance of 2.48 meters and 3.01 metres on it.
(May 2016)

2.A fish pond of elliptical shape is to be inscribed inside a rectangular plot of size 100mX50m. Draw the boundary line of the fish pond (write scale used). (May 2016)

3.The asymptotes of a hyperbola are at right angles to one another and one point on the curve is 15mm from each asymptote. Construct the two branches of the curve and draw a tangent and normal at any point on the curve.
(Dec 2016)

4.A wire unwinds itself from a drum of 60mm radius. Draw the locus of the free end of the wire for unwinding through an angle of 180o. Draw a tangent and normal to the curve obtained.

5. Draw an Archimedean spiral for one convolution with shortest and longest radii 15mm and 90mm respectively. Draw normal and tangent to the curve at a point 60mm away from the pole.

6.A rope 2.5m long is unwound from a stationary drum of 1m diameter holding on the free end of the rope and keeping the rope tight. Trace the path of the free end using a suitable scale. Also draw normal and tangent to the curve at any point.

(May 2017)

7.(a)Construct a forward Vernier of R.F .1/30 to show metres,decimetres,centimetres.The scale is to be used for reading 4m.Mark a distance of 33.5m on the scale.

(b)Construct a conic, when the distance between its focus and directrix is equal to 50mm.And its eccentricity is one. Name the curve. Draw a tangent at any point on the curve

MODULE 2

1.A room is of dimensions 4.8mX4.2mX3.6m. Determine graphically, the distance between a top corner and bottom corner diagonally opposite to it.   (May 2016)

2.A square plate of side 40mm has its surface perpendicular to both HP and VP. One of the sides of the plate is inclined at 30o to HP. Draw its projection.   (May 2016)

3.The projectors drawn from HT and VT of a straight line AB are 100mm apart and those drawn from its ends are 55mm apart. HT is located 50mm in front of VP and VT, 110mm above HP. The end A of the line lies in the HP. Draw the plan and elevation of the line. Also determine its inclinations to the principal planes of projection and true length of the line.

4.A regular pentagonal lamina of 40mm side rests on the HP with its plane surface vertical and inclined at 30o to VP. Draw its top and front views when one of its sides is perpendicular to HP.

5.A straight railway line going uphill from Palakkad due east to Walayar is 20km long and has a slope of 20o. Another railway line from Walayar going 30o east of north to Coimbatore is 25km long. Walayar and Coimbatore are in same level. A new line proposed to connect Palakkad directly to Coimbatore without touching Walayar. Find the true length of this line and its slope.

(May 2017)

6.A circular lamina of 60mm diameter rests on HP on a point of its circumference with the diametrically opposite point touching VP in such a way that the top view is an ellipse with minor axis 40mm. Draw the projections of the lamina.

(May 2017)

MODULE 3

1.Draw the projections of a cube of 35mm edge resting on HP on one of its corners with a solid diagonal perpendicular to the VP (May 2017)

2.A pentagonal pyramid of base side 40mm and axis length 75mm is resting on HP on its base with one of its base side parallel to VP. It is cut by a plane inclined at 35o to HP and perpendicular to VP, bisecting the axis. Draw the sectional top view and true shape of the section.

(May 2016)

3.An equilateral triangular pyramid, side of base 40mm and height 70mm, rests on

one of its edges of the base on the HP. It is then tilted on this edge such that the base is lifted off the ground by an angle of 45o, keeping the axis of the solid parallel to the VP. Draw its plan and elevation in the new position.

4.A right circular cone of 75mm diameter and 100mm long axis rests with its base on the ground. It is cut by a plane inclined at 45o to the HP and perpendicular to the VP and bisecting the axis. Draw the plan and elevation of the cone showing the trace of the section plane on its surface. Also draw the true shape of the section.   (Dec 2016)

5.A hexagonal pyramid of base side 25mm and 70mm axis rests on HP on a corner of base with the slant edge containing this corner making 50o to HP and 30o to VP. Draw the projections.

6.A pentagonal pyramid of base side 25mm and axis 70mm lies on HP on one of its triangular faces with axis parallel to VP. It is cut by a vertical plane making 30o to VP and passing through the midpoint of top view of the axis. Draw sectional plan, sectional elevation and true shape of section.

(May 2017)

MODULE 4

1.A hexagonal pyramid of base side 30mm and height 60mm rests vertically on HP with one of the base sides parallel to VP. It is cut by a section plane inclined at 45o to the HP, perpendicular to the VP and passing through a point on axis, 10mm below the apex of the pyramid. Draw the development of the bottom part of the pyramid.   (May 2016)

2.A vertical cylinder of base diameter 70mm is penetrated by a horizontal cylinder of 70mm diameter, the axis of which is 10mm in front of the axis of vertical cylinder. Draw the projection showing the curves of intersection when the axis of the horizontal cylinder is parallel to HP and VP.

3.A right circular cone of 60mm diameter and 90mm axis rests on its base on the HP. A point P situated on the extreme right end of the base moves around the surface of the cone and finally returns back to the starting point. Find the length of the shortest path the point P will take in covering this distance. Also show the path in plan and elevation.

(Dec 2016)

4.A vertical square prism of 45mm side and 90mm height rests on its base on the HP with a vertical face making an angle of 45o with the VP is intersected by a horizontal square prism of 25mm side. Their axes intersect with each other. The rectangular face of the horizontal prism is also inclined at 45o to the VP. Draw the projections of the solids showing lines of intersection.

5.A cube of side 50mm rests on HP with all lateral faces making equal inclinations to VP. A horizontal circular hole of diameter 40mm, with

its axis perpendicular to VP, is drilled through the cube passing through the center. Develop the lateral surface of the cube showing the drilled hole.
(May 2017)

6.A vertical square prism of base side 50mm and axis 100mm stands on HP on its base with an edge of base making 30o to VP. This is penetrated by another square prism of base side 40mm and axis 100mm with its axis parallel to both planes and all lateral faces equally inclined to VP such that their axes intersect. Draw the three views showing the lines of intersection (May 2017)

MODULE 4

1.Draw the isometric projection of a hexagonal prism of base side 30mm and axis 60mm resting on HP on one of its rectangular faces with its axis perpendicular to VP. (May 2016)

2.A solid is in the form of a square prism of base side 20mm up to a height of 35mm and thereafter tapers in to the frustum of a square pyramid, whose top surface is a square of side 10mm. The total height of the solid is 50mm. Draw the solid in perspective, given that a side of base of the solid is resting on the ground parallel to the picture plane. The end of the side nearest to the eye is 20mm to the right of the eye and 15mm behind the picture plane. The eye is 70mm from the picture plane and 60mm above the ground plane. (May 2016)

3.Draw the isometric projection of a hexagonal prism with a hemispherical top touching all sides. The sides of the hexagonal prism are 45mm each and height 90mm. (Dec 2016)

4.Draw the perspective projection of a circle of 75mm diameter lying on the horizontal plane and whose nearest point is 20mm behind the picture plane and 90mm to left of the central plane. Take the height of the eye equal to 70mm and its distance 65mm.   (Dec 2016)

5.A frustum of a pentagonal pyramid with 50mm side of base, 30mm side of top and 80mm height is standing on the ground on its base. A cube of side 20mm is centrally placed on the top of the frustum. Draw the isometric projection of combination of solids. (May 2017)

6.A cone of 50mm diameter and 70mm axis stand on ground on its base with the nearest point of base 10mm behind the picture plane. The station point is 65mm in front of the picture plane, 60mm above the ground plane and 40mm to the left of the axis of the cone. Draw the perspective view of the cone.
(May 2017)

BASIC CIVIL ENGINEERING

MODULE 1
SHORT ANSWER TYPE(2 marks)

1.Which are the different types of cement?

2.What are the factors affecting the workability of concrete? 3.which are the precautions to be taken while placing the concrete?

3.Write brief notes on following(draw sketches wherever relevant)

(i)grade of cement (ii)need for reinforcement in concrete (iii)fine aggregates

5.Explain the various grades of ordinary portland cement available in India.

6.Explain the classification of bricks used for construction purpose.

7.What are the functions of water in concrete?

8.Write brief notes on following.

(a)advantage of TOR steel (b)water cement ratio

(c)classification of aggregate based on size

LONG ANSWER TYPE(10 marks)

1. which are the tests conducted on bricks to find their suitability as a building material?

2..Explain the methods of compacting and curing of concrete?

3.Explain the different varieties of cement highlighting the applicability under various field Conditions.

4.Differentiate between weigh batching and volume batching.Discuss the relative merits and demerits of each.

5.Write short notes on:

(i)Acid resistant cement   (ii)Blast furnace cement (iii)Sulphate resistant cement (iv)Rapid hardening cement

6.   Explain various market forms of steel sections with neat sketches.

7.Explain the varieties and grades of cement.

8.What are the different market forms of steel available?Explain each one with neat sketch.

MODULE 2

SHORT ANSWER TYPE

1.How are the piles classified?

2. Compare englishbond and flemishbond.

3.write brief notes on following(draw sketches wherever relevant)

(a)machine foundation (b)superstructure of a building

4. What are the conditions under which a raft foundations that are commonly used?

5..Explain the different types of machine foundation that are commonly used.

6.Write brief notes on raft footing

LONG ANSWER TYPE

1. How is the stone masonary classified? Explain.

2. Explain with the help of a sketch the components of a well foundation and also write the common types of well shapes.

3 .Explain with neat sketches   (a)combined footing(b)raft foundation

4 .Expalin with sketches the salient features of (a)english bond (b)flemish bond

5. Explain the classification of deep foundations based on the materials of construction.

6. (a)Discuss briefly the various types of roof covering materials.

(b)Write short notes on random rubble masonary.

7. Draw a detailed sketch of a simple fink truss used for a span of 10 meter.

8. Draw to a suitable scale,the plan for two layers of two brick thick english bond for a corner of building.Also show the elevation.

MODULE 3

SHORT ANSWER TYPE

1.What is the basic principle of surveying?

2.Which are the points to be kept in mind while selecting the survey stations?

3.which are the temporary adjustments of a leveling instrument?

4.write brief notes on following(draw sketches wherever relevant)

(a)cross -staff   (b)axis of the bubble tube   (c)bench marks

5.Explain the principle of "working from whole to part" in surveying.

6.Briefly explain the method to range a line when its end points are inaccessible.

7.Write brief notes on following. (a)reconnaissance (b)back sight (c)change point

LONG ANSWER TYPE

1. Write short notes on

   (a)Reduced level of a point (b)Back sight and fore sight (c)Differential levelling

2. The following readings were succesively taken with an instrument in

leveling work:
0.32,0.53,0.62,1.78,1.91,2.35,1.75,1.91,2.35,1.75,0.35,0.69,1.24 and 0.98m. The position of the instrument was changed after 3rd,7th and 9^{th}readings.The first reading was taken on a BM of R.I.100.00.Calculate the reduced levels of all the points by height of collimation method. Apply the usual check .

3..What is ranging in chain survey? Explain with sketches ,the instruments used for ranging. How is ranging carried out when the end stations are (i)inter visible (ii)not inter visible?

4 .(a)What are the uses of reconnaissance survey?

(b)The following readings were taken with a dumpy level. The instrument was shifted   after 4th and 7th reading.
0.155,2.050,1.850,1.500,2.500,2.105,1.800,0.990.
Calculate the reduced levels of all the stations. Given the RL of stating station is +100.00.

5. (a)Explain the temporary adjustments of a dumpy level.
   (b)Explain the following terms
      (i) Back site
      (ii) Fore site
      (iii) Bench mark
      (iv)Reduced level

6.Following consecutive readings were taken with a dumpy
level and a 4 meter leveling staff
   2.800,2.20,1.550,1.800,0.450,2.180,3.950,0.550,3.655
The level was shifted after the 3rd and the 6^{th}readings.The first reading was taken on a BM
Of RI 100.Calculate the reduced levels of all the points.Also apply the usual check.

7. Explain the field work in surveyband also explain how to overcome the obstruction in chaining.

MODULE 4

SHORT ANSWER TYPE

1. What are the benefits of green buildings?
2.   write brief notes on following(draw sketches wherever relevant)
   (a) floor area ratio (b)intelligent building (c) coverage
3 . write about the muncipal   water supply units.

LONG ANSWER TYPE

1. List down any ten factors which you will consider for the selection of a site for a residential building.

2.Explain in detail the classification of urban roads.

3.Explain the provisions in Kerala Muncipal BuildingRules(KBR) regarding open spaces surrounding a building when the plot abuts a highway and when it abuts a village road. Use sketches to illustrate.

4.Explain in detail the concept of green building.

5.Explain the qualities required for drinking water.

6.Explain the classification of urban and rural roads.

7.What are the factors to be considered for the site selection?
Draw a typical site plan.

8.Describe the different sources of water.

BASIC MECHANICAL ENGINEERING
MODULE-1
SHORT ANSWER QUESTIONS (2 marks)

1.Define and explain Claussius statement of second law of
thermodynamics (Dec 2015)

2.Define a new temperature scale, say degree newton in which the
boiling and freezing points of water (stream and ice points) are 400
degree newton and 100 degree respectively and co-relate this with the
centigrade scale. Also find value of absolute temperature at 0 degree
newton

3.Differentiate fire tube and water tube boilers.   (Dec 2015)

4. Explain equilibrium state of a system

5.Mention any four boiler mountings.

6) Define zeroth law of thermodynamics and explain the concept
of temperature

7)Discuss on latent and sensible heat siting the examples of water and steam

8)Differentiate between open, closed and isolated system (May 2017)

9)What is meant by compounding of turbines? Explain (May2017)

MODULE 2

1) Compare SI and CI engines

2) Define dry bulb and wet bulb temperature in refrigeration
(Dec 2015)

3) Write short note on Otto cycle

4) Define capacity of refrigeration

5) Differentiate between two and four stroke engines. (Dec
2016)

6)Differentiate between summer and winter air conditioning (Dec 2016)

7)Compare Otto and Diesel cycles and highlight the differences.   (May

2017)

8)Explain coefficient of Performance of a refrigeration system (May 2017)

MODULE 3

1)Discuss the difference between centrifugal and reciprocating pumps

2)What are the functions of following parts in power plants?

 a) Condenser in steam power plan

 b) Surge tank in hydraulic power plant

3) Discuss on time study

4) What is the working principle of centrifugal pump? (May 2016)

5) What do you mean by motion study?

6) State two merits and two demerits of a nuclear power plant. (May2016)

7)Compare between impulse and reaction turbines citing example.

8)Discuss specific speed of turbine and how it is employed in the selection of turbine.   (May 2017)

9)Explain fuel rods in Nuclear power plant and pen stock in hydroelectric power plant.   (May 2017)

10)What is scientific management? Explain briefly. (May 2017)

11)What is meant by depreciation? Explain.

MODULE 4

1) What are the different types of welding?

2)What is slip in belt drive? Discuss on the effect slip on velocity ratio

3) Differentiate between annealing and normalizing? (May 2016)

4) Explain any two welding defects

5) What are the differences between belt and chain drives?

6)Discuss classification of gears based on mutual position of shafts (Dec 2016)

7)Explain the manufacturing process "forging".   (Dec 2016)

8) Explain any two major welding defects.

9)What is the function of a clutch? Explain.

LONG ANSWER TYPE (10 MARKS)

MODULE 1

1)a) Derive the expression for adiabatic process

b) Discuss on compounding of turbines   (Dec 2015)

2) a) Discuss on the working of Cochran boiler with sketch

b) A Carnot cycle works with the following parameters

- Adiabatic compression ratio:5
- Isothermal expansion: 2
- Maximum temperature: 550 degree K
- Maximum pressure: 21 bar
- Assuming gamma=1.4 and volume at the beginning of the isothermal

- Expansion is 0.3 meter cube, determine
- Minimum temperature in cycle
- Thermal efficiency

    Pressure at all salient points

    Work done per cycle   (Dec 2015)

3a) Explain enthalpy. Derive the expression for change in enthalpy.

  b)With a neat sketch explain Carnot cycle. A heat engine operates on Carnot cycle is supplied heat at the rate of 1700/kJ/min and gives an output of 9 kW.Determine the thermal efficiency and the rate of heat rejection.

4a) Differentiate saturated steam and dry saturated steam.

  b)What do you mean by compounding of steam turbines? With a neat sketch, explain any two types. (May 2016)

 5)a) Explain zeroth law of thermodynamics and temperature scale.

    b)A vessel having a capacity of 0.85 m cube contains steam at 12bar and 0.92 dry. Steam is blown off from the vessel until the pressure drops to 6 bars. The value is then closed and the vessel is cooled until the pressure is 4 bars. Assuming during the blowing off period, enthalpy per kg of steam remains constant in the vessel, determine:

- The quantity of steam blown off.
- The quantity of steam in the vessel after cooling.
- net change in entropy.
- heat transferred by steam per kg during cooling.

    Properties of steam from steam table for the problem are given below.

Absolute pressure	Temperature	Volume at t3		Enthalpy			Entropy		
		Meter cube per kg		kJ/kg			kJ/kg K		
bar	Degree Celsius	Water	Dry Saturated steam	water	vaporisation	steam	water	vaporisation	steam
P	t5	vf	vg	hf	hfg	hg	sf	sfg	sg

12	188	0.001 13	0.1 63	7 9 8	1984	2782	2.2 16	4.307	6.5 23
6	158. 8	0.001 10	0.3 15	6 7 0	2085	2755	1.9 31	4.830	6.7 61
4	143. 6	0.001 08	0.4 62	6 0 5	2134	2739	1.7 76	5.121	6.8 91

6)a) Discuss the function of steam traps and economizer in a boiler.

b) Heat is supplied to 1 kg of air at 40 bar and 627 degree Celsius at constant pressure till the volume is doubled. The air is then expanded is entropically till the pressure drops to 1 bar. Calculate the work done, change in internal energy and heat transfer : a) at the end of constant pressure heating b)at the end of isentropic expansion. Take R=287 J/kgK,Cv=0.718 kJ/kgK for air.

MODULE 2

1)a)Discuss on the working of four stroke diesel engine with appropriate sketches.

b) Explain coefficient of performance in refrigeration (Dec 2015)

2.a)Explain the functioning of vapour compression refrigeration with sketches

b) Explain the function of carburetor briefly (Dec 2015)

3.a) Differentiate two-stroke and four-stroke engine

b) Explain any two types of lubricating system with a neat sketch

(May 2016)

4.a)Derive expression for efficiency of diesel cycle. A diesel has a compression ratio of 15 and heat addition at constant pressure takes place at 6% of stroke. Find the air standard efficiency of the engine. Take gamma for air as 1.4.

b) Explain summer and winter air conditioning systems, with neat sketches. (May 2016)

5.a) For air standard diesel cycle , the following data is available

- Compression ratio = 16
- Heat added kg=2500kJ/kg
- Lowest temperature in the cycle=300 K
- Lowest pressure in the cycle =1bar
- Assuming Cr=1kJ/kg K and C=0.714kJ/kg K Calculate
- Pressure and temperature at each point in the cycle
- Power output for the cycle for air flow of 0.25 kg/sec
- Thermal efficiency.

b) Explain briefly coefficient of performance in refrigeration (Dec 2016)

6.a) Explain the working of two stroke diesel engine with cycle diagram.

b) Explain the functioning of simple vapour compression refrigeration cycle. (Dec

2016)

7.a) Discuss about carburettor and MPFI system in automobiles

b) Derive and determine thermal efficiency and mean effective pressure of Otto cycle with compression ratio of 5 and working between 21 bars and 1 bar respectively as peak and lowest pressure, assuming gamma=1.4 (May 2017)

8.a) Explain summer and winter air conditioning systems.

b) Explain the working of a vapour compression refrigeration system with a neat figure.   (May 2017)

MODULE 3

1.a) Discuss on the construction details and working of Pelton wheel

b)Explain briefly the contribution of Henry Fayol in industrial engineering (Dec 2015)

2.a) Explain the difference between reciprocating and centrifugal pumps. b) Explain with sketch the details and functioning of thermal power plants. (Dec 2015)

3.a)What are the differences between impulse turbine and reaction turbine?

b) How are pumps classified? With the help of sketch explain the working of reciprocating pump. (May 2016)

4.a)Explain the working of nuclear power plant, with a neat diagram.

b) Enumerate the contributions of F.W Taylor and Gillberth towards industrial engineering. (May 2016)

5.a)Discuss the construction details and working of Kaplan turbines

b) Explain motion study and its applications. (Dec 2016)

6.a) Explain the difference between reciprocating and centrifugal pumps.

b) Explain with sketch, the functioning of Hydroelectric Power plant (Dec 2016)

7)a)Explain the constructional details and working of a Pelton wheel turbine.

b) With a neat sketch, explain the various parts and functioning of a hydro electric power plant. (May 2017)

8)a)Differentiate between centrifugal pumps and reciprocating pumps.

b)Explain the time and motion study. (May 2017)

MODULE 4

1.a)Explain brazing.

b) Discuss briefly on the functioning of clutch with sketch (Dec 2015)

2.a) What is casting? Explain the elements involved in a typical casting process

b) An open belt drive transmits 36KW with a belt velocity of 5m/s.
3.Determine the tensions on each side of the belt, if coefficient of friction is 0.3 and angle of lap is 180 degree. (Dec 2015)

4)a)Explain with neat sketches.
- Three high rolling mill
- Forward extrusion

b) Two pulleys, one 450 m diameter and the other 200 mm diameter,onparallel shafts 1,95 m apart are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt andeach pulley.What power can be transmitted by the belt when the larger pulley rotates at 200 rpm, if the maximum permissible tension in the belt is 1kN and the coefficient of friction between the belt and pulley is 0.25? (May 2016)

5)a) Explain brazing and soldering.
   b)what are the different casting defects? Explain. (May 2016)

6)a) What is welding? Explain the difference types of welding.
   b) Derive the expression for ratio of belt tensions in a belt drive. (Dec 2016)

7)a) Discuss the heat treatment process of steel by annealing and hardening
   b) A flat belt is installed with an initial tension of 2 kN. The angle of lap on smaller pulley is 150 degree .The friction coefficient between the belt and pulley surface is 0.3. The belt runs at a speed of 20 m/s. Determine the power that can be transmitted by this drive, if it is assumed that the belt is perfectly elastic and the centrifugal effect is ignored (Dec 2016)

8)a) With neat sketch, explain extrusion and rolling
   b) Derive expression for ratio of belt tensions and power transmitted in belt drives.

9)a) Explain the processes Annealing, hardening and normalizing.
   b) What are the classifications of gears? Explain. (May 2017)

BASIC ELECTRONICS ENGINEERING
MODULE-1
Short Answer Type: (2-5 Mark Questions)
1. Differentiate between Drift and Diffusion Currents [2015]
3. Differentiate between Avalanche and Zener Breakdown. [2015]

4. What is the need for biasing a transistor ?   [2015]

5. What is meant by biasing of a diode? Explain.   [2017]

6. What is the principle of Transistor Amplification?   [2015]

7.Distinguish between Intrinsic and Extrinsic semiconductors [2013]

7. Derive the relation between α and β of a transistor. [2013]

8. Explain Working of FET   [2013]

9. a.)Draw the V-I characteristics for a FET   [2013]

   b.) Explain the V-I characteristics of a PN Junction Diode [2013]

   c.) Draw the V-I characteristics for Zener Diode.   [2011]

10.What are Photo-Diodes?

11.Give some applications of Photo Diodes   [2013]

12.Draw the symbols of (a.)LED (b.)Transistor (c.) Diode
(d.)Zener Diode   [2012]

13.Explain the working of Zener Diode as a Voltage Regulator [2010]

14.Explain the Energy-Band diagram of a semi-conductor. [2010]

15.Draw the C-E configuration circuit of a transistor   [2008]

16.With neat diagrams, explain the following diodes: (2 marks each)
A.) Zener Diode B.) Varactor Diode C.) Photo Diode D.) Laser Diode
E.) Light Emitting Diode (LED) F.) Schottky Diode G.)Tunnel Diode
H.) PIN Diode

Long answer type: (7-10 marks)

1.Draw the complete model of a diode and state how it differs from
the complete model. [2015]

2.Explain the working of an LED and a Photo-diode.   [2015]

3.Explain how the different types of extrinsic materials are
made[2017]

4.Explain the forward and reverse characteristics of a diode with
neat Graphs. [2017]

MODULE 2

Short Answer Type: (2-5 marks)

1.State the Barkhausen criterion for oscillations   [2015]

2.A full wave rectifier produces 80v peak rectified voltage from a 60 Hz AC supply.
If a 10µF capacitor is used, find ripple factor for a load of 10kΩ.   [2016]

3.What is the advantage of switching regulators over linear regulator

4.Compare the characteristics of CB, CE and CC amplifiers [2016]

5.Explain the working of a transistor LC oscillator

6.In a transistor RC phase shift oscillator, the resistors and
capacitors used in the circuit are equal and of values10kΩ and 0.001µF. Calculate
frequency of oscillations.

7.Draw the transfer characteristics of ideal filters and explain [2017]

8.Explain the working of a crystal oscillator

Long Answer Type: (7-10 marks)

1. Explain the working of a Full Wave Centre Tapped Rectifier with neat diagrams.

[2015]

Determine V_{CE}, V_{BE} and V_{CB} in the given diagram   [2015]

2.Define the voltage gain of a transistor amplifier. What are the factors affecting gain in a common emitter amplifier? Explain the role of emitter bypass capacitor in determining the amplifier gain. [2015]

3.Calculate maximum voltage gain if CE amplifiers with the help of the following values: V_{CC}=8V, R_1=12kΩ, R_2=3.3kΩ, R_C=330Ω, R_E=100Ω, B=150, C_C=10μF.[2015]

 4.Explain the working of an SMPS (Switched mode power supply) with a neat diagram[2015]

5.The rms output of a bridge rectifier is 20 v. What is the PIV accross the diodes? [2016]

6.Draw the circuit of a CE amplifier and explain its principle of amplification. Also explain the need of each component of the circuit[2016]

7.Explain the working of a bridge rectifier.   [2017]

8.Explain the working of a transistor switch   [2017]

9.Draw Circuit diagram and characteristics of CB CE and CE configurations [2017]

10.Explain the working of an RC Phase-Shift oscillator with neat circuit diagram [2017]

11.Explain the working of an SMPS.   [2017]

12.Draw a neat diagram of a CRO and explain its working. [2017]

MODULE 3

Short Answer Type: (2-5 marks)

1.Differentiate between combinational and sequential logical circuits [2015,2016]

2.Differentiate between Micro Processor and Micro Computer [2015]

3.State DeMorgan's theorem of boolean algebra   [2015]

4.Perform the following calculations   [2015]

        a .) 7438 >>( )10   b.) 7FF>>( )10

5. Differentiate between operand and opcode with examples [2015]

6.Design a 2-input NAND gate using NOR gates. [2016]

7. Using boolean laws, prove:

$$AB + \overline{A}C + BC = AB + \overline{A}C$$

[2015]

8. Convert 1011.01 to Decimal and [2017] Hexadecimal

9. Explain the working of an Ammeter.   [2017]

10. Design(or realize) an XOR gate using NOR   [2017]
gates

Long Answer Type: (7-10 marks)
1. Justify the universality of NAND and NOR gates. [2015]
2.Draw a block diagram of C.R.O. And explain its working. [2015,2016]
3.Explain the working of an RC coupled CE amplifier. [2017]
4. Explain the architecture of a micro-processor
5.State and prove DeMorgan's Law.

MODULE 4
Short Answer Type: (2-5 marks)
1. Differentiate between sensors and actuators
2.State Shannon's sampling theorem
3. Explain the concept of negative frequency
4.What is the need for modulation?
5.Explain why FM is superior to AM.   [2015]
6.What is the bandwidth of an amplitude modulated wave if the carrier signal of frequency fc is amplitude modulated by a sinusoidal signal of frequency fm?
[2016]
7.Describe working of sensor for force measurement   [2017]
Long Answer Type: (7-10 marks)
1.Explain the different types of addressing modes with examples.[2015]
2.What is sampling? How does it affect signal reconstruction? [2015]
3.Draw the frequency spectrum of a frequency modulated wave and comment on the bandwidth requirement.   [2015]
4.How are signals classified? Explain   [2016]
5.Derive an expression for amplitude modulated wave. What is the modulation index?
6.Draw the circuit of a diode Demodulator and explain its working [2017]
7.Write notes on: a.) Sampling b.) Quantization c.) Systems d.) Signals
8.Explain Amplitude modulation in analog communications system.   [2017]
9.Prove that bandwidth required for amplitude modulation is twice the frequency of the information signal.   [2017]

ENVIRONMENTAL STUDIES
MODULE 1
PART A(2 MARKS EACH)
1.Fossil fuels are non-renewable.Why?

2.Mention the level of water availability that indicates water stress and water scarcity.

3.Explain the significance of landscapes changes with respect to food security.

4.What are the impacts of over consumption of ground water?

5.Differentiate renewable and non-renewable energy sources?

6.What is maximum carrying capacity?

7.Write down the chemistry of ozone laye depletion and carbondioxide fertilization effect?

8.Give any three examples of renewable energy sources.

9.Define biodiversity hotspot

10.Explain saline water intrusion.

PARTB(EACH QUESTION CARRIES 5 MARKS EACH)

1.How is solar energy converted into electrical power?What are the problems in this regard?

2.What is meant by green revolution?Discuss its impact on food security and enviorment?

3.Explain the impact of deforestation on the enviorment.

4.What are the main reasons for water scarcity in India?How can we reduce the total demand for water?

5."Unsustainable utilization of NTP's will cause for dorestdegradation".Discuss?

6.Give your views on sandmining and its enviorment impact.

7.Briefly explain the role of landuse changes in landslide disaster.Suggest mitigation measures for landslides

8.write a note on the enviormental significance of high altitude shoal/grassland ecosystems.

10.Explain the threats to biodiversity.

11.Explain the enviormental impacts of clay mining and quarrying.

12.Briefly explain the enviormental impacts of dams.

12.Explain the concept of sustainable development.

MODULE 2
PART A(EACH QUESTION CARRIES 2 MARK EACH)

1.Define an ecosystem.What are the main components of an ecosystem?

2.Enumerate the factors that determines the degree of biodiversity in an ecosystem.

3.Discuss on the objective of Montreal protocol.

4.Explain the significance of mega diversity regions of India.

5.All the bioaccumulative substances will not undergo biomagnifications.Justify.

6.Explain the goal of Kyoto protocol.

7.Explain biosphere reserves.

8.Differentiate bioaccumulation with bio magnifications.
PART B(EACH QUESTION CARRIES 5 MARKS EACH)
1.What is an ecological pyramid? What happens to the energy flow as we move up the trophic level?
2.What are the uses of biodiversity? What are the human induced causes of biodiversity losses?
3.Distinguish between in-situ and ex-situconservation.Explain the advantages and disadvantages of each approach.
4.What are tropical rainforests? How are they important to us?
5.Explain ecological succession with suitable examples.
6."consideration of ecosystem values is highly significant for sustainable development "Discuss.
7.Explain various causes and consequences of biodiversity.
8.Participatory forest management is very good approach for forest protection and biodiversity. Explain.
9. Give an account of ecological succession.
10.Explain various ecological pyramids
11.Explain the significance of considering a region as a mega diversity region.
12.Give an account on in-situ and ex-situ conservation methods.

MODULE 3
PART A
1.Discuss various provision for forest conservation act,1980 (APRIL 2017)
2.Explain Eutrophication, acid rain
3.What is noise and what the effect on human health
4.What is different types of pollutants
5.Write down the impacts of dioxins (MAY 2017)
6.Differentiate bioaccumulation with bio magnifications
7.Explain saline water intrusion

PART B
1.Give an account of environmental disaster and their management (10 mark) (APRIL 2017)
2.Give an account of various environmental laws (10 mark)
3.Write down the significance and impacts of nuclear pollution (5 mark) (MAY 2017)
4.Write your views on solid waste problems in Kerala. Suggest remedial measures (5 mark)
5.Explain the causes and consequences of landslides (5 mark)
6.Explain biodiversity act (5 mark)

MODULE 4
PART A
1.What is nuclear holocaust (APRIL 207)
2.What is epicenter and hypocenter

3.Explain the term sustainable development

4.What are the factors that determine the population growth rate 5.Define CRZ (MAY 2017)

6.Explain the reasons for man- wildlife c0nflict

PART B

1.Describe various mechanism for solid waste management (5 mark) (APRIL 2017)

2.What are the sources of air pollution and explain the effects and control measures of air pollution (5 mark)

3.Give an account on the sources of water pollution (5 mark) (MAY 2017)

4.Explain various types of smog (5 mark)

5.Briefly explain the impacts on global warming (5mark)

6.Explain various water conservation strategies and methods (5 mark)

TECHNICAL COMMUNICATION & PROFESSIONAL ETHICS
MODULE 1
(Part A) short answer type[2 marks]

1.Use the correct tenses of verb given in the bracket;

2.The theft (take) place two days ago but police (not get) any clue so far.

3.Fill in the blanks with suitable prepositions.

a. He was walking….the road when the car knocked him.

4.Complete the sentence with a clause having a matching tense and a sensible meaning.

a. If I had time……..{December 2016}

5.Use the correct tenses of verb given in the bracket;

6. Before I(thank) her I (take) her gift.

7. Fill in the blanks with suitable tag

a. I am late for the function ……?

b. She went to her home…….?

8. What is a homonym? give two examples. 2017}

9.Use the correct tenses of verb given in the bracket;

a.Mother (clean)the floor when her son came in she scolded him angrily because he (make) the floor messy with muddy shoes.

10. Fill in the blanks with suitable question tags

a. Sheela got what she wanted…..?

b. They finish the classes at 5 pm.?

c. What are homophones? Give two pairs

12. What do you understand by diplomatic listening?

13. Rewrite as directed

a. I support your plan……?(add a question tag)

b.If I had money.......(complete the sentence using a clause having a matching tense and a sensible meaning)

14. Select an idea of your own and write these sentences 1)simple 2)complex 3)compound conveying the same meaning

15. What is paralanguage?

16. What do you understand by tense of a verb?

What are barriers to listening?

(Part b)long answer type[10marks]

17.Write an essay on the role of body language in communication.

18.Explain in detail the importance if listening in communication {dec 2016}

19.Explain effective listening strategies.

20.Explain effective presentation strategies   {may 2017}

21.What are essentials of good hearing and listening

22.What are the things to be considered while giving and effective presentation   {may 2016}

23.Write a short essay on para language and body language

24.Select a verb of your choice and use its required tense in sentences of your own to explain the difference between

1)Present indefinite and present continuous 2)present perfect and present perfect continuous

3)Past indefinite and past continuous tense 4)past indefinite and past perfect tense {Dec 2015}

MODULE 2

(Part a)short answer type[2 marks]

1.What is the strategies one can use in group discussions

2.Explain with suitable example the term barriers in communication

3.Write short note on agenda of a meeting

4.What is the purpose of minutes of a meeting? {dec 2016}

5.How will you invite your friend to do a project?

6.What are barriers of listening?

7.How will you conclude a discussion?

8.What is the purpose of reading between the lines?
{may 2017}

9.Briefly explain persuasive purpose of giving index for a text?
{May 2016}

10.Assume that you are the secretary of an organization draft a notice to convene a meeting

11.What are the qualities an employ is looking for in a candidate taking part in a group discussion for the selection of job?   {dec 2015}

12.Explain the terms skimming scanning.

(Part B)long answer type[10 marks]

1.If you are applicant for a job taking part in group discussion what are the things you should come out successful in the selection?

2.What are the factors which influence he speed of reading? How can we increase ou speed of reading? {dec 2016}

3.What are the steps we have to consider while participating In group discussion?

4.Explain the reading strategies. {may 2017/may 2016}

5.Write essay on role of feedback and grapevine communication Mention contexts in which you make use of them. What is reading between the lines? Explain its importance. {dec 2015}

MODULE 3

(Part A) short answer type [2 marks]

1. What is a memo? Mention the context in which we write memo

2. What is the meaning of the statement events in report are narrated in chronological order? {Dec 2016}

3. What is the role of graphics in writing? { May 2017}

4. What is illustration? Explain its importance

5. What is expository writing? {May 2016}

6. What is topic sentence? Explain its importance

7. What are the points to be keep while writing a leaflet {dec 2015}

8. What is a report? What are its objectives? {May 2016}

9. What is a brochure? What are the essentials of a brochure? {dec2016}

(Part B) long answer type [10marks]

10. Make notes on the passage given below

11. Prepare a summary about 1/3 of its length

The advantages of helicopter are numerours.it can theoretically land on a garden lawn or city office tool.it is possible to reduce speed so that navigation can be possible to rescue speed so that navigation can be carried out by dropping down to look at a sign post of the engine gives out the rotor continues to revolve and sustain the aircraft upon the pressure of air blades .The speed of revolution of blades are diminished, but the helicopter comes gradually to ret in a sale landing

In practice helicopter continues to have certain inherent advantages such as relatively low speed and rather complex controls because of the low speed .but as a taxi or feeder it may prove invaluable as well as having certain special military and police uses the low speed enables it to be used for regulating traffic for carrying out searches for crop spraying and for other special purpose.

The helicopter continues to have certain inherent disadvantages like relatively low speed and rather complex controls

12. Write short paragraph on "Are strikes in educational Institutions as a means to resolve grievances justified"?

13. Assuming that you are member in charge of publicity prepare a pamphlet in not more than half page of your answer sheet on an inter collegiate sports meet to be held in your college

14. Write a report on interstate science congress hosted by your college

15. Explain the techniques of paragraph writing {may 2017}

16. Prepare a model of institute that offers courses in engineering

17. Explain the points to be notes while preparing notes and while changing notes into text {may 2016}

18. Write an essay on the use of graphics in communication

19. What are the items to be included in the format of a business letter? Write a suitable reply to a customer who has made an enquiry about new model of mobile phone your company has advertised. {dec 2015}

MODULE 4

(Part A) short answer type[2 marks]

1. Explain the stage theory of Kohlberg

2. As an engineer do u think that you loyalty should be to your employer or to the public{dec 2016}

3. How does an engineer keep confidentiality of a program {may 2017}

4. Explain the technique of ethics engineering

5. What is moral autonomy?{May 2016}

6. What is meant by ethics?

7. How can you arrive at a solution for a moral dilemma? {Dec 2015}

(Part B) long answer type [10marks]

1.Mention 3 situations of your choice where there is a conflict between

- Moral principles and interest
- Moral principles and law
- Moral principles and religion How will you resolve these conflicts?

2.A man who has no money to purchase medicine breaks open a shop and steals the medicine to save the life of his ailing wife. Can you justify is action. Support your answer with well-known theory in ethics {dec 2016}

3.Explain the theories about right action

4.Explain the engineers respect for authority. How will an engineer resolve conflicts of interest {may 2017}

5.Explain the rights and actions of an engineer

6.What are the attributes of an ethical personality? {may 2016}

7.Compare Kohlberg's and Gilligan's theories

8.What is collective bargaining? Explain its importance to the Indian context

{dec 2015}

BASIC ELECTRICAL ENGINEERING

MODULE 1

SHORT ANSWER TYPE(2 marks)

1.State and illustrate Kirchhoff's law. (may2015, dec2016, may 2016)

2.A capacitor of 47μf stores 20mj of energy. Obtain the amount of charge in it (may 2016)

3.State coulomb's law. (may 2016)

4.State Thevinin's theorem. (dec 2016,may 2016may2017)

5.State superposition theorem. (may 2016)

6.State and explain ohm's law. Plot ohm's law. Is it a universal law? Why?(may 2015)

7.Three capacitors of capacitances 2μF,4μF,6μF respectively are connected in series to a 220v dc Supply .find (i)total capacitance (ii)charge on each capacitor(iii)potential difference on each capacitor
.   (may 2015)

8.What are the factors affecting capacitance of a capacitor. (dec2016)

9.A circuit consist of three resistors of 3ohm,4ohm, and 6ohm in parallel and a fourth resistor of 4ohm in series. A battery of emf 12V and internal resistance of 6ohm is connected across the circuit. Find the total current in the circuit and terminal voltage across the battery.

10.In the circuit given below, find the current through all the resistances.(May2017)

11.Define capacitance. Derive an expression for total capacitance of a group of capacitors when they are connected in (i)parallel and (ii)series.(May2017)

12. State and explain Norton's theorem. (May2017)

LONG ANSWER TYPE

1. Obtain Thevenin's equivalent for the circuit given below, across x-y terminals.

2. Find the current through the 2ohm resistor of the network given below using superposition theorem.   (may 2016)

3.Find I1, I2, I3 using KVL. (may 2015)

4.(a)What is an(i)ideal voltage source (ii)ideal current source. Also explain   source conversion.

(b)Explain current diversion rate. (may 2015)

5.A 5MF capacitor is charged to 100V and a 10MF capacitor is charged to 250V.They are connected in parallel with terminals of like polarity together. Calculate the final charge on each capacitor and the potential difference across them.   (may2017)

MODULE 2

SHORT ANSWER TYPE(2 marks)

1.Compare a magnetic circuit with an electric circuit. (may 2016)

2.Explain the working of a galvanometer with a neat diagram. (may 2016)

3.The current flowing ina circuit is i(t)=25sin(wt) is applied.Find the active and reactive power.

4.A resistance of 50ohm,inductance of 20mH,and capacitance of 70F is connected in series.Findout the total impedence and powerfactor,if the supply frequency is 50Hz.(may2016)

5.An iron ring has cross sectional area of 400mm^2.and a mean diameter of 20cm.It is wound with 500 turns. If the value of relative permeability is 250.Find the total flux setup in thering.The coil resistance is 474ohm and the supply is 240V. (dec2016)

6.Distinguish between statically induced emf and dynamically

induced emf with examples.

7.A magnetic field is produced by a coil of 300 turns which is wound on a closed iron ring .The ring has a cross section of 20sq.cm and mean length of 120cm.The permeability of iron is 800 .If the current In the coil is 10A,find the energy stored in the magnetic field.(may2017)

8.Two similar coils connected in series gave a total inductance of 600mH and when one coil is reversed, the total inductance is 300mH.Determine the mutual inductance between the   coil and coefficient of coupling.
(may2017)

LONG ANSWER TYPE

1.Explain the working of dynamometer type wattmeter with a neat diagram. (may 2016)

2.An air gap of 0.3cm is cut across a steering of circular cross-section of area 20sq.cm.The average length of the flux path around the ring is 4m.What is the m.m.f required to establish a flux of 2mWb in the air gap. Relative permeability of steel is 1000.Neglect magnetic leakage and fringing.
(dec 2016)

3.State and illustrate the following about electromagnetic induction.
(i)Faraday's law   (ii)Lenz's
law (iii)Flemings right hand rule
(dec 2016)

4.Explain the working of PMMC ammeter with the help of a neat diagram. (dec 2016)

5.(a)Two coils A of 5000 turns and B of 3000 turns lie in the parallel planes A current of 6A in Coil A produces a flux of 0.1mwb.If 60% of the flux produced by coilA links with the turns of coil B when current in coilA changes from5A to-5A in 0.01 second.

(b)A conductor of length 100cm moves at right angles to a uniform magnetic field of flux density of 1.5wb/m^2 with the velocity of 50m/calculate the emf induced in it.Also find the value of emf induced when the conductor moves at an angle of 30degree to the direction of field.   (may2017)

6.Explain the construction and working of an induction type single phase energy meter.

MODULE 3
SHORT ANSWER TYPE(2 MARKS)

1.Compare between series and parallel resonance for an ac circuit. (may 2016)

2.Define RMS value and average value of an alternating

quantity. What do you mean by frequency. (may 2015)

3.What do you mean by resonance in series RLC circuit. Derive an expression for resonating frequency. Draw resonance curve.
(may 2015)

4.What do you understand by average value and effective value of an alternating quantity.

5.Distinguish between star and delta connection in three phase circuits.
(dec 2016)

6.The current flowing through a circuit i(t)=25sin(wt-30°)when a voltage of v(t)=100si(wt) is applied .Find the active and reactive power.   (dec 2016)

7.Define the following terms
(i)cycle(ii)frequency(iii)wavelength(iv)velocity   (may2017)

8.The apparent power drawn by an ac circuit is 10KVA and active power is 8KW.what is the reactive power in the circuit? What is the power factor of the circuit?   (may2017)

9.Derive the relation between line and phase values of voltage and current in a balanced delta connected system with the help of phasor diagram.   (may2017)

LONG ANSWER TYPE

1.For the periodic wave form given below, find:
(i)RMS Value   (ii)average
value (iii)form factor (iv)peak
factor

2.(a)Derive the relation between the line and phase values of voltage and current in a balanced three phase star connection with the help of phasor diagram.
(b)Two circuits the impedance of which are given by Z1=(15+j10)ohm and Z2=(8-j6)ohm are connected in parallel. If the total current is 20A,What is the power taken by each branch.

3.A 1000v,60w lamp is to be operated on 220w ,50Hz main. Find the value of
(i)no inductive voltage. Which method is preferably used. Why?   (may 2015)

4.Non-inductive resistor connected in series with a choke coil is fed from a 250v,50Hz supply. The voltage across resistor is 125V and voltage across coil is 200v.Current flowing through the circuit is 5A.calculate
(i) the reactance of the coil (ii)the inductance of the
 coil (iii)voltage across the choke coil (iv)Power
 absorbed by the choke coil

5.For the trapezoidal wave form given below find
(i) RMS value (ii)average value (iii)form factor
(iv)peak factor

6.(a)What is meant by rms value of an alternating current?
Calculate its value for a sinusoidal current wave. (may2017)

(b)prove that the power drawn by a pure capacitor over a complete cycle is zero.

MODULE 4
SHORT ANSWER TYPE(2 MARKS)
1. Derive the emf equation of a single phase transformer. (may 2016)
2. Briefly explain the working of an induction motor. (may 2016)
3. State the principle of operation of Dc generator and DC motors.   (dec2016)
4. Explain the working principle of transformers.   (dec2016)
5. Draw the circuit diagrams of the different excited dc generators.(may2017)
6. Draw the diagram of a hydroelectric power station and state the advantages and disadvantages.   (may2017)

LONG ANSWER TYPE
1.What are the different types of DC generator?Explain? (may 2016)
2.Explain the components of thermal power plant,with the help of a neat diagram. (may 2016)
3.Explain the working of hydroelectric powerplant with neat diagram.   (may 2015)
4.Briefly explain the important types of DC machines. (dec 2016)
5.With the help of a schematic ,explain the working of a thermal power station. (dec 2016)
6.(a)Explain the principle of operation of 3 phase induction motor.
   (b)What are the applications of DC series motor?(may 2017)
7.With the help of a neat diagram explain the operation of diesel power stations.
                        (may2017)

ENGINEERING MECHANICS
MODULE 1
SHORT ANWER TYPE (2 marks)
1.What is force? Explain type of forces with example (may 2017)
2.Show that angle of friction and angle of repose is same for given surfaces of contact.(may 2017)
3.State and explain Pappus theorem.(May 2017, June 2013)

4.What are the divisions of force systems in a plane? Write their equilibrium equations.

5.State the laws of dry friction.   (dec 2015)

6.State any two application of centroid in engineering (dec 2015)

7.Explain briefly the principle of superposition and transmission.   (May 2016)

8.What are the major classifications of mechanics? Define a rigid body. (Dec 2016)

9.Define 'equilibrium' and state equilibrium equations for a coplanar and parallel force system (Dec 2016)

10.Explain the theorem of transmissibility of force and law of position.   (May 2015)

11.Briefly explain 'principal axes'. (June 2014)

12.What do you mean by equilibrium of a particle? What is equilibrium law? What are the condition of equilibrium for a coplanar force system? (June 2013)

LONG ANSWER TYPE (10 marks)

1.a) A roller 60cm weighing 600N is to be pulled over a rectangular block of height 15cm by a horizontal force applied at the end of a string wound around the circumference of the roller. Find the magnitude of the force, which will just turn the roller over the obstacle.

b) A ladder 12m long rests on a horizontal floor and leans against a vertical wall. The coefficient of friction between the wall and ladder is 0.15 and that between the floor and the ladder is 0.25. Calculate the angle of inclination of the ladder with the floor when it is just about to slip.   (dec 2015)

2.a) Locate the centroid of the area shown in the figure. The curve in the lower middle is a semicircle.

Calculate the second moment of area of an angle section with unequal legs, the length of the legs being 150mm and 100mm, thickness of the section 12mm with respect to the outer edge of the longer leg. (Dec 2015)

3.a) A roller of radius r=50cm rests on a horizontal plane and is held in equilibrium position by a string AC of length 100cm. A heavy bar AB of weight W=500N and length l=150cm is hinged at A and rest on the roller as shown. Neglecting friction

in all contact surfaces, find the tension in the string and the reaction on the roller by the ground.

A uniform of length L=3m and weight W leans against a vertical wall at an angle of 45°.If the coefficient of friction between wall and the ladder is 0.3 and that between the ladder and the ground is 0.5, how high a man of weight W/2 can go up the ladder before it slips? (Dec 2015)

4) a) Determine the y-co-ordinates of the centroid of the parabolic spandrel shown in the figure

b) A right circular cylindrical tank containing water surface is a paraboloid of ACB. What will be the height of water surface is a paraboloid of ACB. What will be the height of water when it comes to rest?

5)Two identical blocks A and B are connected by a rod and rest against vertical and horizontal planes, respectively, as shown in figure µ, assuming it to be the same at both floor and wall.

MODULE 2
SHORT ANSWER TYPE (2 marks)
1.What is product of inertia? When will product of inertia of a given section be a minimum? (May 2017)
2.How is product of inertia defined? What is its significance in engineering?   (Dec 2015)
3.State the principle of virtual work. Explain it with an example. (Dec 2015)
4.State and prove parallel axis theorem of moment of inertia. (Dec 2015)
5.A slender prismatic bar AB of length 'l' and weight W stands in vertical plane and it is supported by smooth surfaces at A and B as shown. Using the principle of virtual work, find the horizontal force P applied at A to keep the bar in equilibrium.   (May 2016)
6.State the physical and mathematical definition of moment of inertia.   (Dec 2016)

7.How do methods of joints and sections for the analysis of plane
trusses differ?

8.Explain with an example the transmissibility of a force to point not
lying along its line of action (Dec 2016)

9.State and prove Varignon's theorem of moments.(May 2015)

10.Differentiate between trusses and frames. (June 2014)

LONG ANSWER TYPE (10 marks)

1) Determine the forces in all the members of the plane truss, as shown in the
    figure. The upper and lower chord members of 2m and vertical members of 3m
    length, each. The magnitudes of forces are 5Kn, each.

2) Determine the axial forces in the members BD, AD and DE of the frame shown
    in the figure.

3) Determine the axial force in the bars of the truss shown in the figure. ABCD is a square
    with AC horizontal

4) Determine the moment of inertia of the z-section shown in the figure with
    respect to the centroidal axes.

MODULE 3
SHORT ANSWER TYPE (2 marks)

1) Differentiate between method of joints and method of sections in the analysis of plane trusses. (May 2017)

2) The acceleration of a particle is given by $a=t^3-2t^2+4$,
where 't' is in seconds. The particle after travelling for 2
seconds attains a velocity of m/s, and covers a distance of 15m. Determine the equations of velocity and displacement.(May 2017)

3) A sphere of mass M dropped vertically from height 'h' on to the horizontal floor and raised to a height of 0.8h after one bounce. Determine coefficient of restitution. (May 2017)

4) State and explain D'alembrt's principle in rectilinear translation. (Dec 2015)

5) Define the coefficient of restitution. What are its values for elastic, semi-elastic and plastic impacts? (Dec 2015)

6) A car travels with velocity $v=20(1-e^{-1})$m/s where t is the elapsed time in seconds. Determine the distance travelled in 3 second.(May 2016)

7) Determine the acceleration of block A, if the acceleration of block B is $2m/s^2$.

8) State the impulse-momentum principle in rectilinear translation. (May 2016)

9) Explain with an example the transmissibility of a force to a point not lying along its line of action. Dec 2016)

10) State the equation of a particle moving along a straight line and due to a force which is proportional to its displacement(any example may be employed).(Dec 2016)

11) Derive the principle of work and energy in rectilinear translation from the different equation of equilibrium. (Dec 2016)

12) The velocity-time relationship of a moving particle is given by the equation $V=1/2ct^2$ where $c=2.4m/s^3$. Determine the displacement of the particle at the instant $t_3=3$ sec, if there was no initial displacement.

13) A wood block weighing 22.25N rests on a smooth horizontal surface. A revolver bullet weighing 0.14N is shot horizontally into the side of the block. If the block attains a velocity of 3m/s, what is the muzzle velocity 'v' of the bullet?

14) The motion of a particle is defined by the relation $x=3t^4-10t^2+3t+20$, where x represents the distance traveled by the particle in meters and 't' represents the time in seconds. Determine the

position, the velocity and the acceleration of the particle when t=5s. (June 2014)

15)Explain the principle of work and energy. (June 2014)

LONG ANSWER TYPE (10 marks)

1) a) A stone is dropped into a well with no initial velocity and 4.5 s later; the sound of impact is heard. Then a second stone is thrown into the well with an initial velocity of the second stone.

b) A bullet moving with the velocity of 330 m/s penetrates through a plank. The bullet has a velocity of 286 m/s, the moment it comes out of the plank. Determine the number of planks through which it penetrates before it comes to rest. (May 2017)

2)a) A body moving with a uniform acceleration is observed to travel 33 m in the eighth second and 53 m in the 13thsecond of its travel. Calculate its initial velocity and uniform acceleration.

b) A train moves with uniform speed of 36 kmph if the resistance to motion is 1/200 of the weight of the train? (Dec 2015)

3)a) Two blocks A and B are released from rest on a 30° incline, when they are 18m apart. The coefficient of friction under the upper block A is 0.2 and that under the lower block B is 0.4. In what time will block A reach block B? After they touch and move as a single unit, what will be the contact force between them? The weights of the blocks A and B are 100N and 80N, respectively.

b) When a ball of weight W rests on a spring of constant k, it produces a static deflection of 2.5cm. How much will the same ball compress the spring if it is dropped from a height of 30cm? Neglect the mass of the spring.

(Dec 2015)

4)a) The driver of an automobile, travelling along a straight level highway, suddenly applies brakes so that the car skids for 2s covering a distance 10m before coming to rest. Assuming that during this time the car moves with constant deceleration, find the coefficient of friction between the tyres and the road.

b) A wooden block of weight 50N rests on a rough horizontal plane, the coefficient of friction between the two being 0.4. If the bullet weighing 0.2N is fires horizontally into the block with a muzzle velocity v=600 m/s, how far will the block be displaced from its position, assuming the bullet remains inside the block? (May 2016)

5)For the pile and pile driver shown in figure, the following numerical data are given: W_1=1000kg, W_2=500kg, h=3.5m, and the coefficient of restitution, e=1/4. If the resistance to penetration is constant and is equal to 27Kn, how many blows of the hammer will be required to drive the pile by 1m. (Dec 2016)

6)Motion of a particle along a straight line is given by the equation a=t^2-2t+2 wherea- acceleration in m/s^{2}t- time in secondAfter 1 second,

the distance traveled by the particle and the velocity of the particle were found to be 14.75m and 6.33m/s. Find (i) the distance traveled (ii) the velocity and (iii) the acceleration of the particle after 2 seconds.

7)A particle is moving with simple harmonic motion and perform 8 complete oscillations per minute. If the particle is 5cm from the centre of the oscillation, determine the amplitude, the velocity of the particle at a distance of 7cm from the centre of oscillation is 0.6 times the maximum velocity.(May 2015)

MODULE 4
SHORT ANSWER TYPE (2 marks)

1.What is a compound pendulum? Explain. (May 2017)

2.State and explain the principle of angular momentum. (May 2017)

3.Derive the equation of the time period of small oscillations of simple harmonic motion choosing suitable example.(Dec 2015)

4.State the principle of moment of momentum and the principle of angular momentum.

5.Derive the relationship connecting work and energy in translation or rotation, starting from the governing (kinetic) equation of motion.(Dec 2015)

6.Derive the expression for the period of oscillation of a compound pendulum. (May 2016)

7.A cord is wrapped around a wheel of radius 0.1m initially at rest. If a force is applied to the cord and gives it an acceleration $a=4t$ m/s^2 (where't' is in seconds), determine the angular velocity of the drum as a function of time. (May 2016)

8.Derive the normal and tangential component of acceleration at an instant of a particle executing curvilinear translation, in the terms of its tangential velocity. (Dec 2016)

9.Derive the angle of projection to obtain maximum range for projectile along an inclined plane. (Dec 2016)

10.Define D'alembert's principle for the rotation of rigid bodies. (May 2015)

11.State and explain the principle of angular momentum. (May 2015)

12.Briefly explain 'moment of momentum'.(June 2014)

13.A flywheel rotating at 1500rpm come to rest with constant angular deceleration in 100seconds owing to friction in the bearings. If the moment of inertia of the flywheel with respect to its axis of rotation I=12.5kgm^2, determine friction couple that produces this angular deceleration. (June 2014)

LONG ANSWER TYPE (10marks)

1.a) A car from rest on a curved road of radius 250m and attains a speed of 18kmph at the end of 60 seconds while travelling with uniform acceleration. Find the tangential and normal accelerations

of the car 30 seconds after it started.

(B)if the coefficient of friction, μ=0.2 between the wheel and the road , find at what speed a vehicle can get round a curve of 50m radius without sideslip

(i)On a level road.

(ii)On a road banked to a slope of 1 vertical to 8 horizontal. (iii)At what speed can the vehicle travel on the banked road without any lateral frictional support(dec 2015)

2.a) A shaft of radius 'r' rotates with constant angular speed ω in bearing for which the coefficient of friction is μ. Through what angle ø will it rotate after the driving torque is removed?

b) A homogeneous plate having the shape of an equilateral triangle with the edges of length 'a' hangs in a vertical plane by pins at two of its vertices. Calculate the reaction at one of the pins, an instant after the other pin is removed. (Dec 2015)

3.a) A car travels around a horizontal circular track that has a radius of 90m. If the car increases its speed at a constant rate of 2 m/s^2, determine the time needed for it to reach a resultant acceleration of 3 m/s^2.

b) Two adjacent guns fires bullets at 300 m/s simultaneously at angle of elevation α_1 and $\alpha_2$for the same target at a range for the same target at a range of 200m. Calculate the time difference between the two hits. (May 2016)

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