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14MAT11

First Semester B.E. Degree Examination, June/July 2015
Engineering Mathematics - I

Time: 3 hrs.

Max. Marks:100

Note: *Answer FIVE full questions, selecting at least TWO questions from each part.*

MODULE– I

1 a. If $y^{1/m} + y^{-1/m} = 2x$ prove that
$$(x^2 - 1)y_{n+2} + (2n+1)xy_{n+1} + (n^2 - m^2)y_n = 0$$
(07 Marks)

b. Find the pedal equation for the curve
$$r^m = a^m \sin m\theta + b^m \cos m\theta$$
(06 Marks)

c. Derive an expression to find radius of curvature in cartesian form. (07 Marks)

OR

2 a. Find the nth derivative of $\sin^2 x \cos^3 x$ (07 Marks)

b. Show that the curves $r = a(1+\cos\theta)$ and $r = b(1-\cos\theta)$ intersect at right angles. (06 Marks)

c. Find the radius of curvature when $x = a \log(\sec t + \tan t)$. $y = a \sec t$. (07 Marks)

MODULE– II

3 a. Using Maclaurin's series expand tan x upto the term containing x^5. (07 Marks)

b. Show that $x \dfrac{\partial u}{\partial x} + y \dfrac{\partial u}{\partial y} = 2u \log u$ where $\log u = \dfrac{x^3 + y^3}{3x + 4y}$ (06 Marks)

c. Find the extreme values of $x^4 + y^4 - 2(x - y)^2$ (07 Marks)

OR

4 a. Evaluate $\lim\limits_{x\to 0} \left\{ \dfrac{e^x \sin x - x - x^2}{x^2 + x \log(1-x)} \right\}$ (07 Marks)

b. If $u = x \log xy$ where $x^3 + y^3 + 3xy = 1$ Find $\dfrac{du}{dx}$ (06 Marks)

c. If $u = \dfrac{yz}{x}$, $v = \dfrac{xz}{y}$, $w = \dfrac{xy}{z}$, find $\dfrac{\partial(u, v, w)}{\partial(x, y, z)}$. (07 Marks)

MODULE– III

5 a. Find div $\vec{F}$ and Curl $\vec{F}$ where
$$\vec{F} = \text{grad} \left(x^3 + y^3 + z^3 - 3xyz\right)$$
(07 Marks)

b. Using differentiation under integral sign,
Evaluate $\int\limits_0^1 \dfrac{x^\alpha - 1}{\log x} dx$ $(\alpha \geq 0)$
Hence find $\int\limits_0^1 \dfrac{x^3 - 1}{\log x} dx$ (06 Marks)

c. Trace the curve $y^2(a - x) = x^3$, $a > 0$ use general rules. (07 Marks)

OR

6 a. If $\vec{r} = xi + yj + zk$ and $r = \left|\vec{r}\right|$ then prove that $\nabla r^n = n r^{n-2} \vec{r}$ **(07 Marks)**

b. Find the constants a, b, c such that $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$ is irrotational. Also find ϕ such that $\vec{F} = \nabla\phi$ **(06 Marks)**

c. Using differentiation under integral sign,

Evaluate $\int\limits_0^\infty e^{-\alpha x} \dfrac{\sin x}{x} dx$ **(07 Marks)**

MODULE– IV

7 a. Obtain reduction formula for $\int\limits_0^{\pi/2} \cos^n x \, dx$ **(07 Marks)**

b. Solve : $(1 + 2xy\cos x^2 - 2xy)dx + (\sin x^2 - x^2)dy = 0$ **(06 Marks)**

c. A body originally at $80°C$ cools down to $60°C$ in 20 minutes, the temperature of the air being $40°C$. What will be temperature of the body after 40 minutes from the original ? **(07 Marks)**

OR

8 a. Evaluate $\int\limits_0^{2a} x^2 \sqrt{2ax - x^2} \, dx$ **(07 Marks)**

b. Solve : $xy(1 + x y^2)\dfrac{dy}{dx} = 1$ **(06 Marks)**

c. Find the orthogonal trajectories of the family of confocal conics $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2 + \lambda} = 1$ where λ is parameter. **(07 Marks)**

MODULE– V

9 a. Solve by Gauss elimination method
$5x_1 + x_2 + x_3 + x_4 = 4$, $x_1 + 7x_2 + x_3 + x_4 = 12$, $x_1 + x_2 + 6x_3 + x_4 = -5$,
$x_1 + x_2 + x_3 + 4x_4 = -6$ **(07 Marks)**

b. Diagonalize the matrix $A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ **(06 Marks)**

c. Find the dominant eigen value and the corresponding eigen vector of the matrix
$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$
by power method taking the initial eigen vector $(1, 1, 1)^1$ **(07 Marks)**

OR

10 a. Solve by L U decomposition method
$x + 5y + z = 14$, $2x + y + 3z = 14$, $3x + y + 4z = 17$ **(07 Marks)**

b. Show that the transformation $y_1 = 2x_1 - 2x_2 - x_3$, $y_2 = -4x_1 + 5x_2 + 3x_3$, $y_3 = x_1 - x_2 - x_3$ is regular and find the inverse transformation. **(06 Marks)**

c. Reduce the quadratic form $2x_1^2 + 2x_2^2 + 2x_3^2 + 2x_1x_3$ into canonical form by orthogonal transformation. **(07 Marks)**

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USN [| | | | | | | | |]   **14PHY12/22**

First/Second Semester B.E. Degree Examination, June/July 2015
Engineering Physics

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer FIVE questions, selecting ONE full question from each part.*
2. *Physical constants : Velocity of light, $c = 3 \times 10^8$ m/s; Planck's constant,*
$h = 6.63 \times 10^{-34}$ Js ; Mass of electron, $m = 9.1 \times 10^{-31}$ kg; Charge of
electron, $e = 1.6 \times 10^{-19}$ C ; Boltzmann's constant, $k = 1.38 \times 10^{-23}$ J/K.

PART – A

1 a. Write the assumptions of quantum theory of radiation and deduce Rayleigh-Jeans law from Planck's law. **(05 Marks)**
   b. Give four important properties of matter waves. **(04 Marks)**
   c. Set up time independent Schrodinger wave equation in one dimension. **(07 Marks)**
   d. Calculate the energy in eV, for the first excited state of an electron in an infinite potential well of width 2Å. **(04 Marks)**

2 a. State de Broglie hypothesis and show that the group velocity of the de Broglie waves of a particle is equal to the velocity of the particle. **(05 Marks)**
   b. State and explain Heisenberg's uncertainty principle. **(05 Marks)**
   c. Explain in brief the properties of wave function. If the wave function of a particle in an infinite potential box of width 'a' is $\psi = B \sin(n\pi x/a)$ where x is the position and n is the quantum number, find B. **(06 Marks)**
   d. The wavelength of a fast neutron of mass 1.675×10^{-27} kg is 0.02nm. Calculate the group velocity and the phase velocity of its de Broglie waves. **(04 Marks)**

PART – B

3 a. Obtain an expression for the conductivity of a metal from quantum mechanical considerations. **(06 Marks)**
   b. Show that the Fermi level of an intrinsic semiconductor lies in the middle of the forbidden energy gap. **(05 Marks)**
   c. Explain the temperature dependence of resistivity of metal and state Matthiessen's rule. **(05 Marks)**
   d. Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi level at 300k. **(04 Marks)**

4 a. Define the terms drift velocity, mean free path, mean collision time and relaxation time. **(04 Marks)**
   b. Explain Hall effect. Arrive at the equation for Hall coefficient in terms of Hall voltage and current through the specimen. **(08 Marks)**
   c. Describe Maglev vehicle. **(04 Marks)**
   d. Calculate the concentration at which the acceptor atoms must be added to a germanium sample to get a p – type semiconductor with conductivity 0.15 per ohm-metre. Given the mobility of holes = 0.17 m^2/Vs. **(04 Marks)**

PART – C

5   a. Derive an expression for the radiant energy density under thermal equilibrium using Einstein's coefficients. **(07 Marks)**

   b. With suitable ray-diagrams, explain the principle construction of a holographic images. **(05 Marks)**

   c. Give an account of point to point communication system using optical fibers. **(04 Marks)**

   d. The angle of acceptance of an optical fiber kept in air is 30°. Find the angle of acceptance when the fiber is in a medium of refractive index 4/3. **(04 Marks)**

6   a. Discuss the requisites and the conditions for a laser system. **(06 Marks)**

   b. Define angle of acceptance and numerical aperture. Obtain an expression for the numerical aperture of an optical fiber. **(06 Marks)**

   c. Explain measurement of pollutant in atmosphere using lasers. **(04 Marks)**

   d. A 5W pulsed laser emits light of wavelength 694 nm. If the duration of each pulse is 20ns, Calculate the number of photons emitted per pulse. **(04 Marks)**

PART – D

7   a. Mention the geometrical configurations of the seven crystal systems. **(07 Marks)**

   b. Sketch and describe the Perovskite structure. **(05 Marks)**

   c. Derive Bragg's equation. **(04 Marks)**

   d. The atomic radius of gold is 0.144nm. Determine the interplanar distance for (110) planes assuming that gold belongs to FCC system. **(04 Marks)**

8   a. With the help of vector diagram explain the terms basis vectors, lattice vector, interfacial angles and crystal parameters of a space lattice. **(06 Marks)**

   b. Derive an expression for interplanar distance in terms of Miller indices. **(05 Marks)**

   c. Define coordination number and packing factor. Compute the packing factor for BCC crystals. **(05 Marks)**

   d. In a calcite crystal, second order Bragg's reflections occur from the planes with d-spacing 3Å, at a glancing angle of 24°. Calculate the path difference between x-rays reflected from the two adjacent planes. Also, Calculate the wavelength of the x-rays. **(04 Marks)**

PART – E

9   a. Define shock waves. Mention its properties. **(06 Marks)**

   b. What are nanomaterials? Outline the structure of a carbon nano tube. **(06 Marks)**

   c. What is a scanning electron microscope? Mention its three applications. **(04 Marks)**

   d. The distance between the two pressure sensors in a shock tube is 100mm. The time taken by a shock wave to travel this distance is 200 microsecond. If the velocity of sound under the same conditions is 340 m/s, find the Mach number of the shock wave. **(04 Marks)**

10 a. Define Mach number, subsonic waves and supersonic waves. **(03 Marks)**

   b. Discuss the basics of conservation of mass, momentum and energy. **(09 Marks)**

   c. Explain the sol-gel method of preparing nanomaterials. **(04 Marks)**

   d. In a scanning electron microscope, electrons are accelerated by an anode potential difference of 60 kilo volt. Estimate the wavelength of the electrons in the scanning beam. **(04 Marks)**

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First/Second Semester B.E. Degree Examination, June/July 2015

Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

Note: *Answer FIVE questions, selecting*
ONE full question from each part.

PART – A

1 a. Explain the construction and working of glass electrode. **(05 Marks)**
   b. Give the construction of calomel electrode. Justify that it is a reversible electrode. **(05 Marks)**
   c. Discuss the construction and working of Li – MnO_2 battery. **(05 Marks)**
   d. What are fuel cells? How is it different from galvanic cell? Mention any two advantages of fuel cell. **(05 Marks)**

2 a. Define reference electrode. Explain the measurement of standard electrode potential using Calomel electrode. **(05 Marks)**
   b. A cell is obtained by combining two Cd electrodes immersed in cadmium sulphate solutions of 0.1M and 0.5M at 25°C. Give the cell representation, cell reaction and calculate EMF of the cell. **(05 Marks)**
   c. Describe the construction and working of Zinc – Air battery. **(05 Marks)**
   d. Explain the construction and working of methanol – oxygen fuel cell. Mention any two applications. **(05 Marks)**

PART – B

3 a. What is stress corrosion? Explain stress corrosion in boilers due to alkali with chemical reactions. **(05 Marks)**
   b. How does the following factor affect the rate of corrosion?
      i) Nature of corrosion product.   ii) Temperature   ii) pH. **(05 Marks)**
   c. Explain the following factors influencing rate of electro – deposit.
      i) current density   ii) metal ion concentration   iii) throwing power. **(05 Marks)**
   d. Explain the process of electroplating of chromium for engineering applications. Indicate the reasons for not employing chromium as anode. **(05 Marks)**

4 a. What is cathodic protection? Explain sacrificial anodic method and impressed current method. **(05 Marks)**
   b. Explain the electro chemical theory of corrosion by taking iron as an example. **(05 Marks)**
   c. Write a short note on
      i) polarisation   ii) Decomposition potential **(05 Marks)**
   d. Explain the process of electroless plating of copper on PCB. **(05 Marks)**

PART – C

5 a. On burning 1.15g of a coal sample in a bomb calorimeter, the temperature of 3.5kg of water in the calorimeter increased from 26.5°C to 28.5°C. Water equivalent of calorimeter is 325g. Specific heat of water 4.187kJ/kg°C . Latent heat of steam = 587 Cal/g. If the fuel contains 4% hydrogen, calculate gross and net calorific values. **(05 Marks)**

b. Explain synthesis of petrol by Fischer Tropseh process. (05 Marks)
c. Discuss the construction and working of a photovoltaic cell. (05 Marks)
d. Explain the production of solar grade silicon by Union – Carbide process. (05 Marks)

6 a. Define octane number. Explain reformation of petrol with equations. (05 Marks)
b. What is biodiesel? How is it prepared? What are the advantages? (05 Marks)
c. What is doping? Explain doping of Si by diffusion Technique. (05 Marks)
d. Explain the designing of PV cells – Module, panel and Array. (05 Marks)

PART – D

7 a. Explain the free radical mechanism of polymerisation taking vinyl Chloride as a monomer. (06 Marks)
b. Differentiate addition and condensation polymerisation. (04 Marks)
c. Give the synthesis reaction of Teflon and polycarbonate. (04 Marks)
d. Discuss the synthesis, properties and applications of epoxy resin. (06 Marks)

8 a. Explain the following structure property relationships of polymers.
   i) Crystalinity   ii) Elasticity   iii) Plastic deformation. (06 Marks)
b. Explain the following factors influencing the Tg.
   i) Flexibility   ii) Branching and cross linking (04 Marks)
c. Explain the synthesis of carbon fibre. (04 Marks)
d. What is conducting polymer? Explain the mechanism of conduction in polyaniline and give the applications. (06 Marks)

PART – E

9. a. What is boiler feed water? Explain the priming and foaming in boilers. (05 Marks)
b. Define COD. Discuss the Experimental determination of COD of waste water. (05 Marks)
c. What is nano material? Discuss the synthesis of nano material by gas condensation and precipitation methods. (05 Marks)
d. Write a note on carbon nano tubes. (05 Marks)

10 a. Explain the activated sludge treatment of sewage water. (05 Marks)
b. Discuss the Desalination of sea water by reverse osmosis. (05 Marks)
c. Explain the synthesis of nanomaterials by hydro thermal process. (05 Marks)
d. Write a note on Dendrimers. (05 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2015
Programming in C and Data Structures

Time: 3 hrs.   Max. Marks:100

Note: *Answer FIVE questions, selecting*
ONE full question from each part.

PART – 1

1 a. What are data types? Mention the different data types supported by C language, giving an example to each. **(05 Marks)**

b. Write a C program which takes as input p, t, r, compute the simple interest and display the result. **(05 Marks)**

c. What is an operator? List and explain various types of operators. **(10 Marks)**

2 a. What is a token? What are different types of tokens available in C language? Explain. **(08 Marks)**

b. Write C expressions corresponding to the following (Assume all quantities are of same type)

   i) $A = \dfrac{5x + 3y}{a + b}$ ii) $B = \sqrt{s(s-a)(s-b)(s-c)}$ iii) $C = e^{|x+y-10|}$

   iv) $D = x^{25} + y^{35}$ v) $X = \dfrac{e^{\sqrt{x}} + e^{\sqrt{y}}}{x \sin \sqrt{y}}$ vi) $X = \dfrac{-b + \sqrt{b^2 - 4ac}}{2a}$.   **(06 Marks)**

c. What is the value of 'x' in following code segments? Justify your answers :

```
   i) int a, b ;        ii) int a, b ;
      float x ;            float x ;
      a = 4 ;             a = 4 ;
      b = 5 ;             b = 5 ;
      x = b/a ;           x = (float) b/a ;
```
(06 Marks)

PART – 2

3 a. What are different types of conditional decision making statements? Explain each with examples. **(10 Marks)**

b. Write a C program to simulate simple calculator that performs arithmetic operations using switch statement. Error message should be displayed, if any attempt is made to divide by zero. **(10 Marks)**

4 a. Explain with examples formatted input output statements in C. **(06 Marks)**

b. List four differences between while loop and do-while loop along with syntax and example. **(06 Marks)**

c. Design and develop a C program to reverse a given four digit integer number and check whether it is a palindrome or not. **(08 Marks)**

PART – 3

5 a. What is an array? Explain different methods of initialization of single dimensional arrays.
(06 Marks)

  b. Write a C program to read N integers into an array A and to
    i) find the sum of odd numbers
    ii) find the sum of even numbers
    iii) find the average of all numbers
    Output the results computed with appropriate headings. (06 Marks)

  c. How string is declared and initialized? Explain any FOUR string manipulation functions with examples. (08 Marks)

6 a. Explain function call, function definition and function prototype with examples to each.
(06 Marks)

  b. What are actual parameters and formal parameters? Illustrate with example. (06 Marks)

  c. What is recursion? Write a C program to compute the factorial of a given number 'n' using recursion. (08 Marks)

PART – 4

7 a. How structure is different from an array? Explain declaration of a structure with an example.
(06 Marks)

  b. Explain with an example, how to create a structure using 'typedef'. (04 Marks)

  c. Write a C program to input the following details of 'N' students using structure :
    Roll No : integer,   Name : string,   Marks : float,   Grade : char
    Print the names of the students with marks $\geq 70.0\%$. (10 Marks)

8 a. Explain following file operations along with syntax and examples :
    i) fopen( )   ii) fclose( )   iii) fscanf( )   iv) fprintf( )   v) fgets( ). (10 Marks)

  b. Write a C program to read the contents from the file called abc·text, count the number of characters, number of lines and number of white spaces and output the same. (10 Marks)

PART – 5

9 a. Define point variable. Explain with an example, the declaration and initialization of pointer variable. (06 Marks)

  b. Explain following C functions along with syntax and example to each :
    i) malloc( )   ii) calloc( )   iii) realloc( )   iv) free( ). (08 Marks)

  c. Develop a C program to read two numbers and function to swap these numbers using pointers. (06 Marks)

10   Write short notes on following :
  a. Preprocessor directives
  b. Primitive and non primitive data types
  c. Stack operations
  d. Types of queues. (20 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2015
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.   Max. Marks:100

**Note: *Answer FIVE questions, selecting ONE full question from each part.***

PART – A

1 a. Explain in brief the scope of the following civil engineering fields:
      i)   Structural engineering
      ii) Water resources engineering.   **(06 Marks)**
   b. State and explain the basic idealizations in mechanics.   **(06 Marks)**
   c. A system of forces are acting on a rigid bar as shown in Fig.Q.1(c). Reduce this system to
      i)   A single force
      ii) A single force and a couple at 'A'
      iii) A single force and a couple at 'B'.   **(08 Marks)**

Fig.Q.1(c)
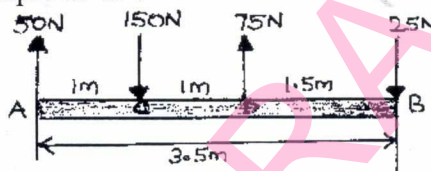
2 a. Define couple moment and list the characteristics of a couple.   **(06 Marks)**
   b. With the help of the neat sketch, explain the cross-section of road and its structural components.   **(08 Marks)**
   c. Replace the force and couple system by an equivalent force and moment at '0' for the Fig.Q.2(c).   **(06 Marks)**

Fig.Q.2(c)
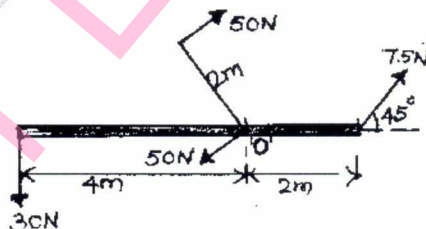
PART – B

3 a. Define the following: i) Resultant force; ii) Composition of force; iii) Resolution of force.   **(06 Marks)**
   b. Two cables attached at the top of tower carries a guy cable AB. Determine the tension in guy cable such that the resultant of the forces in all three cables acts vertically down. Also find the resultant force [refer Fig.Q.3(b)].   **(10 Marks)**
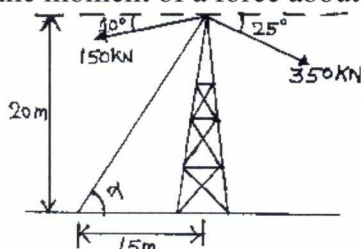   c. Find the moment of a force about 'P' [Fig.Q.3(c)].   **(04 Marks)**
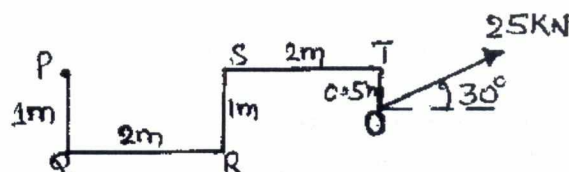

Fig.Q.3(b)   Fig.Q.3(c)

4 a. State and prove parallelogram law of forces. **(05 Marks)**

b. Four forces are acting on a vertical bar AB as shown in Fig.Q.4(b). Determine the resultant and its point of intersection from 'A'. **(05 Marks)**

c. Find the resultant magnitude, direction and its point of application from 'A' for the square subjected to load as shown in Fig.Q.4(c). **(10 Marks)**
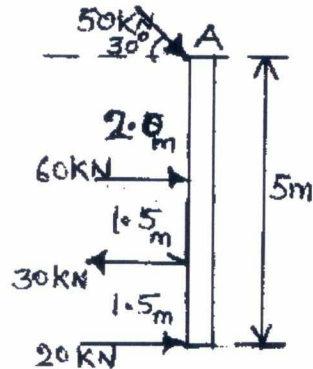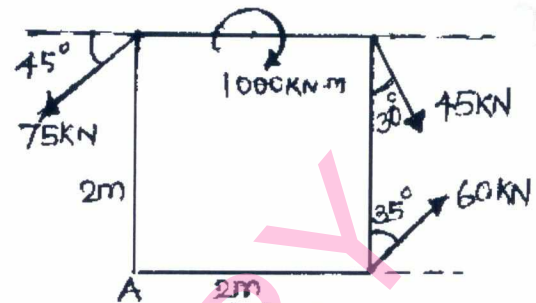
Fig.Q.4(b)

Fig.Q.4(c)

PART – C

5 a. State and prove Lami's theorem. **(04 Marks)**

b. State the laws of dry friction. **(06 Marks)**

c. Determine the reactions at contact points shown in Fig.Q.5(c). **(10 Marks)**

Fig.Q.5(c)
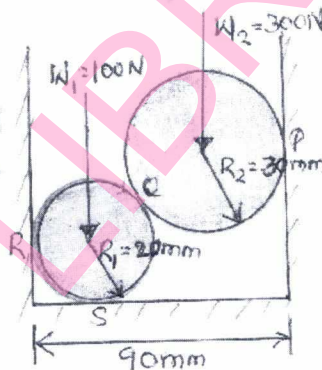
6 a. For the block shown in Fig.Q.6(a), find the minimum value of 'P' which will just disturb the equilibrium of the system ($\mu = 0.5$). **(05 Marks)**

b. Knowing that $W_A = 100N$ and $\theta = 30°$, determine the smallest and largest value of W_B for which the system is in equilibrium [Refer Fig.Q.6(b)]. **(10 Marks)**

c. A ladder weighing 200N is to be kept in position as shown in Fig.Q.6(c) resting on a smooth floor and leaning against a small wall. Determine the horizontal force required to prevent it from slipping when a man weighing 700N is at a height of 2m above the floor level.

(05 Marks)

Fig.Q.6(a)

Fig.Q.6(b)

Fig.Q.6(c)

PART – D

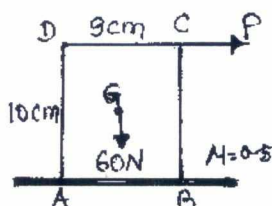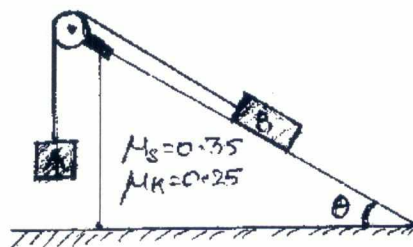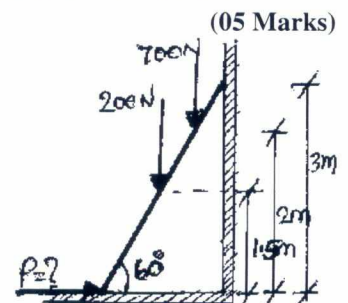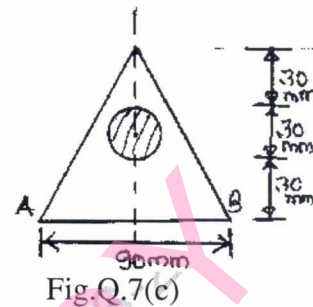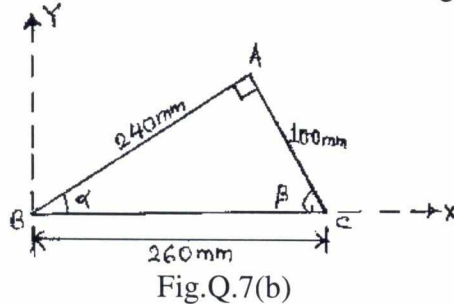**7** a. Derive an expression for the moment of inertia of a rectangle from first principles about its vertical centroidal axis. **(06 Marks)**

b. A thin homogeneous wire is bent into a triangle shape ABC such that AB = 240mm, BC = 260mm and AC = 100mm. Locate the C.G of wire with respect to coordinate axes. Angle at 'A' is a right angle. [Refer Fig.Q.7(b)]. **(08 Marks)**

c. Calculate the MOI of the lamina shown in Fig.Q.7(c) about 'AB'. **(06 Marks)**

Fig.Q.7(b)

Fig.Q.7(c)

8 a. Derive an expression for the centroid of a quarter circle on its diametrical axis. **(08 Marks)**

b. Find the moment of inertia of the lamina shown in Fig.Q.8(b) about its horizontal (xx) centroidal axis. [Unshaded area] **(12 Marks)**

Fig.Q.8(b)
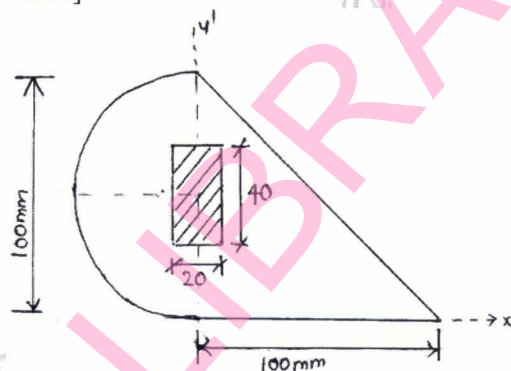
PART – E

9 a. Define the following: i) Displacement ; ii) Velocity; iii) Acceleration ; iv) Speed; v) Deceleration. **(05 Marks)**

b. Derive equations of motion:
i) With uniform acceleration   ii) Distance travelled. **(05 Marks)**

c. A police officer observes a car approaching at the unlawful speed of 60 kmph. He gets on his motor cycle and starts chasing the car, just as it passes in front of him. After accelerating for 10 secs, at a constant rate, the officer reaches his top speed of 75 kmph. How long does it take the officer to overtake the car from the time he started? **(10 Marks)**

10 a. A flywheel starts rotating from rest and is given an angular acceleration of 1 rad/sec^2. Determine the angular velocity and speed in rpm after 90 seconds.
If the flywheel is brought to rest with an uniform angular retardation of 0.5 rad/sec^2. Find the time required by the flywheel to come to rest. **(06 Marks)**

b. What is super elevation and why it is provided? **(04 Marks)**

c. A projectile is fired from the top of cliff 150m height with an initial velocity of 180 m/sec at an angle of elevation of 30° to horizontal. Neglecting air resistance; determine: i) the greatest elevation above the cliff; ii) the great elevation above the ground reached by the particle; iii) The horizontal distance from the gun to the point where the projectile strikes the ground. **(10 Marks)**

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First/Second Semester B.E. Degree Examination, June/July 2015
Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks:100

Note: *Answer FIVE full questions, selecting*
ONE full question from each part.

PART – A

1 a. What are the advantages and disadvantages of renewable and non renewable energy sources? **(05 Marks)**
   b. What is calorific value? Compare biofuels with petroleum fuels in terms of calorific value. **(05 Marks)**
   c. Explain with neat sketch, working of Babcock and Wilcox boiler. **(10 Marks)**

2 a. Explain briefly the principle of conversion of solar energy directly in to electrical energy in a solar cell. **(10 Marks)**
   b. Write a short note on wind energy and its conversion. **(10 Marks)**

PART – B

3 a. Differentiate between reaction and impulse turbines. **(05 Marks)**
   b. With neat sketch explain the working of pelton wheel. **(10 Marks)**
   c. Differentiate between petrol engine and diesel engine. **(05 Marks)**

4 a. With neat sketch explain working of 4 stroke diesel engine. **(10 Marks)**
   b. With neat sketch explain the working of closed cycle gas turbine. **(06 Marks)**
   c. Define : Thermal efficiency and mechanical efficiency of IC engine. **(04 Marks)**

PART – C

5 a. Name the various operations carried out on lathe. Explain taper turning by swivelling compound rest. **(08 Marks)**
   b. What is milling? With neat sketch explain end milling and plane milling operations. **(06 Marks)**
   c. Differentiate between: (i) Counter sinking and counter boring, (ii) Reaming and Boring. **(06 Marks)**

6 a. Define Robot. Write the classification based on robot physical configuration. Write down the applications of industrial robot. **(08 Marks)**
   b. What is automation? Explain the types of automation with examples. **(07 Marks)**
   c. With block diagram explain basic components of NC system. **(05 Marks)**

PART – D

7 a. What are ferrous metal? Write a note on stainless steel. Write down its applications. **(08 Marks)**
   b. Differentiate between ferrous and non ferrous materials. **(06 Marks)**
   c. What is soldering? Classify soldering process. **(06 Marks)**

8 a. Define welding. Explain electric arc welding process. Write down its demerits. **(08 Marks)**
   b. Differentiate between welding, Brazing and soldering. **(06 Marks)**
   c. Define composite materials. Write down its practical applications. **(06 Marks)**

PART – E

9 a. What are the required properties of a good refrigerant? **(06 Marks)**
   b. With neat sketch explain the working of vapour compression refrigeration system. **(10 Marks)**
   c. What is a air conditioning? Why it is necessary? **(04 Marks)**

10 a. Define : (i) Refrigeration effect (ii) Unit of Refrigeration (iii) COP of Refrigeration. **(06 Marks)**
   b. List the commonly used refrigerants. **(04 Marks)**
   c. Explain with neat sketch the principle of room air-conditioner. **(10 Marks)**

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14ELE15/25

First/ Second Semester B.E. Degree Examination, June/July 2015
Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

Note: *Answer any FIVE full questions,*
selecting ONE full question from each part.

PART – 1

1 a. State and explain Faraday's laws of electromagnetic induction. **(06 Marks)**
   b. An air cored solenoid has a length of 50 cm and a diameter of 2 cm. Calculate its inductances if it has 1000 turns and also find the energy stored in it, if the current rises from zero to 5A. **(06 Marks)**
   c. If the total power dissipated in the circuit shown is 18W, find the value of 'R' and its current. **(08 Marks)**

Fig.Q1(c)
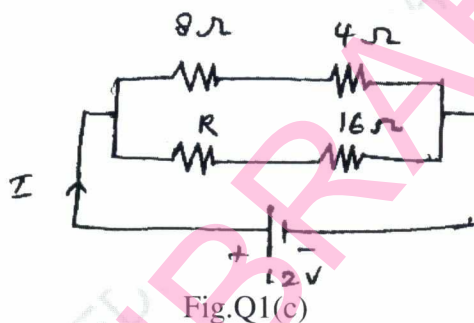
2 a. State the following :
   i) Fleming's right hand rule
   ii) Fleming's left hand rule. **(06 Marks)**
   b. A closed iron ring of mean diameter 12 cm is made from round iron bar of diameter 2 cm. It has a uniform winding of 1000 turns. Calculate the current required to produce a flux density of 1.5 wb/m² given that relative permeability is 1250. Hence calculate the self inductance. **(08 Marks)**
   c. What is the potential difference between the point x and y in the network shown? **(06 Marks)**

Fig.Q2(c)
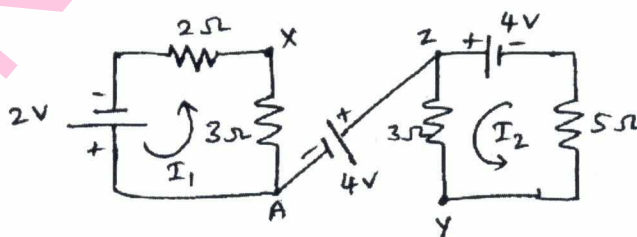
PART – 2

3 a. Explain the characteristics of DC series motor with a neat diagram. **(06 Marks)**
   b. Explain the significance of back emf in DC motor. **(05 Marks)**
   c. 4 pole DC shunt motor takes 22.5A from a 250V supply, $R_a = 0.5\Omega$ and $R_{sh} = 125\Omega$. The armature is wave wound with 300 conductors. If the flux per pole is 0.02wb. Calculate :
   i) speed
   ii) torque developed
   iii) power developed. **(09 Marks)**

4 a. With a neat diagram, explain the construction and working of dynamo-meter type wattmeter.
(06 Marks)

b. A 4 pole generator with wave wound armature has 51 slots, each having 24 conductors. The flux per pole is 0.01 wb. At what speed must the armature rotate to give an induced emf of 220V? What will be the voltage developed if the winding is lap and the armature rotates at the same speed. **(10 Marks)**

c. Explain with a diagram, the construction features of various parts of a DC generator. **(04 Marks)**

PART – 3

5 a. What is meant by power factor in AC circuit? What is its significance in AC circuits?
(06 Marks)

b. Draw and explain the wiring diagram for the 3 – way control of lamp. **(06 Marks)**

c. A series circuit with resistance of 10 Ω, inductance of 0.2H and capacitance of 40 μF is supplied with a 100 V supply at 50 Hz. Find the current, power and power factor of the circuit. **(08 Marks)**

6 a. State form factor of an alternating quantity. Derive the expression for it. **(08 Marks)**

b. Show that the average power consumed in a pure capacitance is zero. Draw the neat waveform for voltage, current, power. **(06 Marks)**

c. With a neat diagram, explain pipe earthing. **(06 Marks)**

PART – 4

7 a. With the usual notation, derive the expression for EMF equation of an alternator. **(06 Marks)**

b. Establish the relationship between phase and line values of voltage and currents in 3 phase delta connected circuit. Show the phasor diagram neatly. **(06 Marks)**

c. A balanced star connected load of (8+6j) Ω/phase is connected to 3 phase, 230V supply. Find the line current, power factor, power reactive volt-ampere and total volt-ampere. **(08 Marks)**

8 a. Show that the power in a balanced 3 – phase circuit can be measured by 2 wattmeters. Draw the circuit and vector diagram. **(08 Marks)**

b. Explain the generation of 3 – phase AC voltage. **(04 Marks)**

c. A 3 – phase, 50 Hz, 16 pole generator with star connected winding has 144 slots with conductor /slot is 10. The flux per pole is 24.8 m wb is sinusiodally distributed. The coils are full pitched. Find : i) speed ii) the line emf. **(08 Marks)**

PART – 5

9 a. Explain the construction and working principle of a transformer with a neat sketch. **(08 Marks)**

b. Explain the concept of rotating magnetic field in a 3ϕ induction motor. **(06 Marks)**

c. The frequency of the emf in the stator of a 4 pole induction motor is 50 Hz and in the rotor is 1.5 Hz. What is the slip and at what speed is the motor running? **(06 Marks)**

10 a. What is 'slip' in an induction motor? Explain why slip is never zero in an induction motor.
(06 Marks)

b. A single phase transformer has 400 turns primary and 1000 secondary turns. The net cross – sectional area of the core is 60 cm^2. The primary winding is connected to a 500V, 50 Hz supply. Find :
   i) Peak value of flux density
   ii) emf induced in the secondary winding. **(06 Marks)**

c. The maximum efficiency at full load and unity p.f. of a single phase 25 KVA, 500/1000V, 50Hz transformer is 98%. Determine its efficiency at
   i) 75% load, 0.9 p.f. and
   ii) 50% load, 0.8 p.f. **(08 Marks)**

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First / Second Semester B.E. Degree Examination, June / July 2015
Basic Electronics

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting ONE question from each part.*

PART - A

1   a. Draw and explain V – I characteristics of a Germanium Diode.   **(05 Marks)**
    b. Find the value of the series resistance R, required to drive a forward current of 1.25mA through a Germanium diode from a 4.5V battery. Write the circuit diagram showing all the value.   **(04 Marks)**
    c. With neat diagram, explain the working of a half wave rectifier along with relevant waveforms.   **(07 Marks)**
    d. Discuss in brief clipping circuit. Explain the working of a positive clipper with neat circuit diagram and relevant waveforms.   **(04 Marks)**

2   a. Explain the working of a full wave rectifier using 2 diodes with neat diagram. Also derive the expressions for I_{dc} and I_{rms} of a full wave rectifier.   **(10 Marks)**
    b. Discuss in brief clamping circuit. Explain working of a negative clamper.   **(04 Marks)**
    c. Distinguish between Zener and Avalanche breakdown.   **(06 Marks)**

PART - B

3   a. Calculate the value of I_C, I_E and β_{dc} for a transistor with $\alpha_{dc} = 0.98$ and $I_B = 120\mu A$.
                                                                                 (06 Marks)
    b. For the base bias circuit, $V_{cc} = 18V$, $R_c = 2.2K\Omega$, , $R_B = 470k\Omega$, $h_{fe} = 100$ and $V_{BE} = 0.7V$. Find I_B, I_C and V_{CE}. Draw the DC load line and indicate the Q point.   **(08 Marks)**
    c. Discuss the ideal characteristics of an operational amplifier.   **(06 Marks)**

4   a. Explain the voltage follower circuit using operational amplifier. Mention its important properties.   **(05 Marks)**
    b. Design an adder circuit using Op – amp to obtain an output voltage of $V_0 = 2[0.1V_1 + 0.5V_2 + 2V_3]$, where V_1, V_2 and V_3 are input voltages. Draw the circuit diagram.   **(08 Marks)**
    c. Design a voltage divider bias circuit to operate from a 12V supply with $V_{CE} = 3V$, $V_E = 5V$ and $I_C = 1mA$, $V_{BE} = 0.7V$.   **(07 Marks)**

PART - C

5   a. With the help of a diode switching circuit and truth table explain the operation of an AND gate and OR gate.   **(06 Marks)**
    b. State and prove Demorgan's theorem for three variables.   **(06 Marks)**
    c. With truth table and logical expressions, give the design of a full adder circuit. Realize the circuit using i) Basic gates and   ii) NAND gates.   **(08 Marks)**

6   a. Perform the following conversions :
        i) $(1234.56)_8 = (?)_{10}$ ii) $(10110101001.101011)_2 = (?)_{16}$ iii) $(988.86)_{10} = (?)_2$
        iv) $(532.65)_{10} = (?)_{16}$ v) $(ABCD.EF)_H = (?)_8$.   **(05 Marks)**

b. i) Subtract $(1000.01)_2$ from $(1011.10)_2$ using 1's and 2's complement method.
   ii) Add $(7AB.67)_{16}$ with $(15C.71)_{16}$. **(05 Marks)**
c. Design a half adder circuit and realize using Basic gates and NAND gates. **(05 Marks)**
d. What are Universal gates? Realise AND and OR gate using Universal gates. **(05 Marks)**

PART - D

7 a. Distinguish between a Latch and flipflop. **(04 Marks)**
   b. Explain i) See beck effect   ii) Peltier effect and iii) Thomson effect. **(06 Marks)**
   c. Explain the architecture of 8085 microprocessor, with neat diagram. **(10 Marks)**

8 a. Explain the working of a LVDT with neat diagram. **(06 Marks)**
   b. List the difference between a microprocessor and micro controller. **(08 Marks)**
   c. Explain the working of a R – S flipflop with relevant circuit and truth table. **(06 Marks)**

PART - E

9 a. What is Modulation? Mention some of the need for modulation in communication system. **(06 Marks)**
   b. Give the comparison between AM and FM. **(08 Marks)**
   c. With block diagram, explain the working of a cellular mobile communication system. **(06 Marks)**

10 a. Define Amplitude modulation and derive the expression for AM wave with relevant waveforms. Draw the frequency spectrum. **(08 Marks)**
   b. With neat diagram, explain the working of a telephone system. **(06 Marks)**
   c. An audio frequency signal $10 \sin (2\pi \times 500)t$ is used to amplitude modulate a carrier of $50 \sin(2\pi \times 10^5 t)$. Calculate
      i) Modulation index.
      ii) Sideband frequencies.
      iii) Band width.
      iv) Amplitude of each sideband.
      v) Total power delivered to a load of 600Ω.
      vi) Transmission efficiency. **(06 Marks)**

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Question Paper Version : D

First/Second Semester B.E Degree Examination, June/July 2015

Constitution of India and Professional Ethics

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries **ONE mark**.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. "Ego centric tendencies" means
   a) Arrogant and irresponsible behaviour   b) Habit of condemning the view of others
   c) Interpreting situation from limited view   d) Superiority complex.

2. One process or function of one component that effect the other and spread the adverse effect to the entire system is observed in
   a) Loosely coupled   b) Tight coupled
   c) Complexly interactive   d) None of these

3. A fault tree is used to
   a) Assess the risk involved   b) Claim compensation
   c) Take free consent   d) Improve safety

4. Conflicts of interest may be
   a) Created   b) False   c) Potential   d) All of these

5. The owner of the "Patent Right" retain his patent for
   a) 20 years   b) 50 years   c) 75 years   d) 100 years

6. Bi – Cameral means
   a) Presence of no house in the state   b) Presence of one house in the state
   c) Presence of two house in the state   d) None of the above

7. 73rd and 74th Constitutional Amendment is pertaining to
   a) Local self Government   b) Extention of Reservation to SC & ST
   c) State hood of Goa   d) Land Reform

8. President can proclaim the emergency with the recommendation of
   a) Vice President   b) Lok Sabha   c) Prime Minister   d) Union Cabinet

9. How many time National Emergency has been so far declared in India
   a) Once   b) Twice   c) Thrice   d) Never

10. President made proclamation of emergency on the grounds of Internal disturbance for first time in
    a) 1975   b) 1965   c) 1962   d) 1950

11. Which of the following shall not be introduced in Rajya Sabha
    a) Money bill   b) Union budget
    c) Constitutional Amendment   d) Finance bill

12. Before entering upon the office president has to take an Oath before
    a) Chief election commissioner   b) Vice - President
    c) Chief Justice of India   d) Lok Sahba speaker

13. The President of India is elected on the basis of
    a) Proportional representation by means of single transferable vote
    b) Single member territorial representation
    c) Adult franchise   d) Direct Election

14. Which Assembly is presided over by the non - member
    a) Lok Sabha   b) Rajya - Sabha   c) State Assembly   d) All of these

15. Power of the Supreme court to decide dispute between the centre and the state falls under
    a) Advisory Jurisdiction   b) Original Jurisdiction
    c) Appellate Jurisdiction   d) Constitutional Jurisdiction

16. Right to primary Education guaranted under the Article 21A was incerted to the constitution by _____ Amendment
    a) 61st Amendment   b) 74th Amendment   c) 86th Amendment   d) 97th Amendment

17. Right to freedom guaranted under Article 19 ____ during emergency
    a) can be restrained   b) cannot be restrained
    c) can be suspended   d) cannot be suspended

18. Which one of the writ literally means "you may have the body"
    a) Mandamus   b) Certiorasi   c) Quo - Warranto   d) Habeaus - Corpus

19. The person arrested has to be produced before the magistrate within
    a) One week   b) 24 hours   c) 72 hours   d) 2 months

20. Who described the DPSP as the Novel features of the Indian constitution
    a) Dr. B.R. Ambedkar   b) Motilal Nehru
    c) Madhav Rao N   d) L.M. Singhivi

21. The Constituent Assembly was created as per the proposal of
    a) Cabinet Mission   b) Simon Mission
    c) Cripps Mission   d) Indian National congress

22. The Preamble to the Indian Constitution is borrowed from
    a) Britain Constitution   b) Objective Resolution
    c) Canada Constitution   d) Australia Constitution

23. The Constitution of India provides for
    a) Single citizenship   b) Double citizenship
    c) Multiple citizenship   d) No citizenship

24. The final interpreter to the Indian Constitution is
    a) Speaker of Lok - sabha
    b) Parliament
    c) President
    d) Supreme court

25. Parliamentary system in India is based on the pattern of
    a) Great Britain
    b) USA
    c) France
    d) Canada

26. Tendency of shifting responsibility will locally come down if there is a
    a) Group think
    b) Microscopic vision
    c) Fear
    d) Obligation to public

27. The judges of the district court are appointed by
    a) president
    b) Chief justice of India
    c) Prime Minister
    d) Governor

28. Legislative council / Rajya sabha is dissolved
    a) Dissolved after 2 years
    b) Dissolved after 5 years
    c) Dissolved after 6 years
    d) Is not subject to dissolution

29. "To Encourage the formation of co-operative societies". This directive principle was added to the constitution under
    a) 42nd Amendment
    b) 44th Amendment
    c) 97th Amendment
    d) 118th Amendment

30. The obligation and prerogative associated with specific role is referred as
    a) Duty
    b) Role Morality
    c) Responsibility
    d) Ethics

31. The Electroral system of India is largely based on the pattern of
    a) France
    b) USA
    c) Great Britain
    d) Ireland

32. Election to the Lok – Sabha and Rajya Sabha are conducted on the Basis of
    a) Audult franchise
    b) Single transferable vote
    c) Proportional representation
    d) Limited suffarage

33. Engineering ethics is
    a) Preventive ethics
    b) Developing ethics
    c) Natural ethics
    d) Scientifically developed ethics

34. One of the characteristic of profession is
    a) It demands high standard of honesty
    b) It provides opportunity to help the poor and needy
    c) Usually it is having monopoly
    d) It is having tough competation.

35. "Good work" means
    a) Work above and beyond the call of duty
    b) Responsible work
    c) Work involving high risk
    d) Superior work done with great care & skill

36. How many judges are their in the Supreme court including the Chief Justice of India
    a) 15
    b) 19
    c) 26
    d) 31

37. The procedure for amending the Indian constitution is
    a) Partly Rigid and Partly flexible
    b) Very Rigid
    c) Very flexible
    d) Occasionally done.

38. Who Acts as a Chief legal advisor to the Government
    a) Union Law Minister
    b) Attorney general
    c) Chief justice of India
    d) None of these

39. Who is the executive constitutional lead of the State Government
    a) Chief Minister
    b) President
    c) Prime Minister
    d) The Governor

-D3-

40. The ordinance issued by the Governor are subject to the approval by the
    a) State legislature
    b) President
    c) Chief justice of High court
    d) Chief - Minister

41. The enforcement of DPSP depends on
    a) The will of the Government in power
    b) The judiciary
    c) Resources available with the government
    d) All of these

42. "Uniform Civil Code" means
    a) A codified civil law applicable to all person of India irrespective of their religion
    b) A code related to Individual public life
    c) A code meant for Hindus only
    d) A code meant for muslims only

43. Village panchayat are the best example for India's ___ form of Government
    a) Republic
    b) Democratic
    c) Sovereign
    d) Socialist

44. The Fundamental Duties of Indian Citizen were
    a) Enshrined in original constitution
    b) Added to the constitution by 42nd Amendment
    c) Added to the constitution by 44th Amendment
    d) Added to the constitution by 46th Amendment.

45. Who acts as a President when neither the president nor the Vice – President is available
    a) Speaker of lok sabha
    b) Attorney general of India
    c) Chief justice of India
    d) Speaker of Rajya Sabha

46. 26th November 1949 is a significant day in our constitutional history because
    a) The constitution was adopted on that day
    b) The India took pledge of complete independence on that day
    c) India became republic on that day
    d) The first amendment to the constitution was passed on that day.

47. Fundamental Rights can be claimed against
    a) Judiciary
    b) Individual
    c) State
    d) All of these

48. The main objective of the cultural and Educational Rights granted to the citizen is to
    a) Preserve the rich cultural heritage of India
    b) Help the minorities to conserve their culture
    c) Evolve a single integrated Indian culture
    d) All of these

49. This is not a ground to impose restriction on freedom of speech and expression
    a) Morality or decency
    b) Contempt of court
    c) National security
    d) Law and order

50. The writ of Habeaus corpus is issued
    a) In the form of an order calling upon a person who has detained another person to bring that person before the court and show authority for such detention
    b) By a superior court to a lower court not to exceed its jurisdiction
    c) By a superior court to the subordinate court to do something in the nature of its allotted duty
    d) In form of an order to stop proceeding in certain case.

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First/Second Semester B.E Degree Examination, June/July 2015
Environmental Studies
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries **ONE mark**.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. The process of movement of nutrients from the soil by acid rain is called
   a) Transpiration   b) Thermosphere   c) Infiltration   d) Leaching

2. Which of the following is not a method for water conservation:
   a) rain water harvesting   b) reducing water usage
   c) ground water extraction   d) water recycling

3. Smog is
   a) natural phenomenon   b) combination of smoke and fog
   c) colourless   d) all of these

4. The wild life protection act in India was passed in
   a) 1978   b) 1972   c) 1986   d) 1992

5. Air (prevention and control of pollution) Act in India was passed in
   a) 1970   b) 1975   c) 1981   d) 1990

6. The pH value of the acid rain water is
   a) 5.7   b) 7.0   c) 8.5   d) 7.5

7. Ozone layer thickness is measured in
   a) PPM   b) PPB   c) Decibels   d) Dobson units

8. Eutrophication is
   a) An improved quality of water in lakes
   b) A process in carbor cycle
   c) The result to accumulation of plant nutrients in water bodies
   d) A water purification technique.

9. Wind energy generation depends on
    a) direction of wind   b) velocity of wind
    c) humidity   d) precipitation

10. Nitrate concentration above 45 mg/lt causes
    a) Vomiting   b) Dysentery
    c) Typhoid   d) Blue Baby disease

11. Ozone hole is said to occur when the ozone level decreases below
    a) 200 Du   b) 2000 Du   c) 20 Du   d) 2 Du

12. Acid rain can be controlled by
    a) reducing SO_2 and NO_2 emissions   b) reducing CO and hydrocarbons emissions
    c) Increasing number of lakes   d) None of these

13. Animal husbandry may result in
    a) Global warming   b) Acid rain
    c) Ozone depletion   d) None of these

14. Freons are
    a) HFC   b) CFC   c) NFC   d) Hydrocarbons

15. Ozone hole was first discovered over
    a) Arctic   b) Antartica   c) Tropical region   d) Africa.

16. Nutrient cycling is most related to appropriately.
    a) Energy, waste, nutrients   b) Autotrophs, nutrients, decomposers
    c) Light, weight, nutrients   d) None of these

17. In an ecosystem, the flow of energy is
    a) Bidirectional   b) Cyclic   c) Unidirectional   d) Multidirectional

18. Which of the following is not a part of the hydrological cycle?
    a) Precipitation   b) Infiltration   c) Transpiration   d) Perspiration

19. The word 'Environment' is derived from
    a) Greek   b) French   c) Spanish   d) English

20. Which of the following is the terrestrial ecosystem?
    a) Forest   b) Grass land   c) Desert   d) All of these

21. LPG is a mixture of
    a) N_2 and H_2S b) CO_2 and N_2
    c) Propane and butane   d) Methane and ethane

22. Nuclear fusion reaction occurs in
    a) The sun   b) Stars   c) Hydrogen bomb   d) All the these

23. Choose the sequence of production of electricity from hydrogen
   i)   Electrolysis of water
   ii) Performing a fuel cell reaction
   iii) Storage of hydrogen
   a) (i), (ii), (iii)   b) (i), (iii) and (ii)   c) (ii), (iii) and (i)   d) (ii), (i) and (iii)

24. Chernobyl nuclear disaster occurred in the year
   a) 1984   b) 1952   c) 1986   d) 1987

25. Which resources are inexhaustible?
   a) renewable   b) fossil fuel   c) non renewable   d) mineral

26. Which of the following is not a part of atmosphere?
   a) Heterosphere   b) Mesosphere   c) Biosphere   d) Stratosphere

27. EIA study will help
   a) Maximizing the benefits without overloading the planets ecosystem.
   b) To estimate the future needs of the society.
   c) To smooth implementation of the project.
   d) To cope up with rapid growth of population.

28. Sustainable development means
   a) Meeting present needs without compromising on the future needs.
   b) Progress in human well beings.
   c) Balance between human needs and the ability of earth to provide the resources.
   d) All of these.

29. Mineral resources are
   a) Renewable   b) Non renewable
   c) Equally distributed   d) None of the above

30. India has the largest share of which of the following?
   a) Manganese   b) Mica   c) Copper   d) Diamond

31. Fluoride though is an effective agent to preventing dental caries, has a maximum permissible limit of
   a) 0.5 mg/lt of water   b) 1.5 mg/lt of water
   c) 5 mg/lt of water   d) 15 mg/lt of water

32. Carbon content is higher in
   a) Soil   b) Atmosphere   c) Water   d) Lining matter

33. Cholera and typhoid are causes by
   a) Worms   b) Virus   c) Bacteria   d) Fungus

34. The required iron content in drinking water as specified by BIS is
   a) 300 mg/lt b) 30 mg/lt c) 3 mg/lt d) 0.3 mg/lt

35. Major source of fluoride is
   a) River water   b) Tooth paste   c) Ground water   d) Food products

36. The Tiger conservation project was started is
    a) 1973   b) 1974   c) 1981   d) 1990

37. The leader of "Chipko movement" is
    a) Sunder Lal Bahuguna   b) Medha Patkar
    c) Vandana Shiva   d) None of these

38. "Earth day" is observed on
    a) 1st December   b) 5th June   c) April 22nd   d) 1st January

39. The committee which submitted its report to government of India on environmental education is
    a) Tiwari Committee   b) Mehta Committee
    c) Banerjee Committee   d) Agarwal Committee

40. BOD means
    a) Biochemical oxygen demand   b) Chemical oxygen demand
    c) Biophysical oxygen demand   d) All of these

41. Direct conversion of solar energy is attained by
    a) Solar photo voltaic system   b) Solar diesel hybrid system
    c) Solar thermal system   d) Solar air heater

42. Which place in India the tidal energy has been experimented?
    a) Goa   b) Karnataka   c) Kerala   d) Tamil Nadu

43. Hydrogen energy can be tapped through
    a) heat pumps   b) fuel cells   c) photovoltaic cells   d) gasifiers

44. Molasses from sugar industry is used to generate
    a) biodiesel   b) hydrogen   c) bioethanol   d) biomethanol

45. Bhopal gas tragedy caused due to the leakage of
    a) Methyl ISO Cyanate (MIC)   b) Methane
    c) Sulphur dioxide   d) Carbon monoxide

46. Noise pollution limits at residential area
    a) 80 dB   b) 45 dB   c) 60 dB   d) 90dB

47. Ozone layer is present in
    a) Troposphere   b) Stratosphere   c) Mesosphere   d) Thermosphere

48. Odour in water can be removed by
    a) Aeration   b) Changing pH   c) Sedimentation   d) None of these

49. Which of the following is an air pollutant:
    a) Oxygen   b) Particulate matter   c) Nitrogen   d) Carbon dioxide

50. The protocol that reduces green house gas emission is
    a) Kyoto protocol   b) Montreal protocol   c) Vienna protocol   d) Basal protocol

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USN | | | | | | | | | | | **14MAT21**

Second Semester B.E. Degree Examination, June/July 2015
Engineering Mathematics – II

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting ONE full question from each part.*

PART – A

1. a. Solve $4\dfrac{d^4y}{dx^4} - 4\dfrac{d^3y}{dx^3} - 23\dfrac{d^2y}{dx^2} + 12\dfrac{dy}{dx} + 36y = 0$. **(06 Marks)**

   b. Solve $\dfrac{d^3y}{dx^3} + 6\dfrac{d^2y}{dx^2} + 11\dfrac{dy}{dx} + 6y = e^x + 1$ using inverse differential operator method. **(07 Marks)**

   c. Solve $(D^2 - 2D)y = e^x \sin x$ using method of undetermined coefficients. **(07 Marks)**

2. a. Solve $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$. **(06 Marks)**

   b. Solve $(D^2 + 4)y = x^2 + e^{-x}$ using inverse differential operator method. **(07 Marks)**

   c. Solve $(D^2 - 2D + 2)y = e^x \tan x$ using method of variation of parameters. **(07 Marks)**

PART – B

3. a. Solve $\dfrac{dx}{dt} - 7x + y = 0,\ \dfrac{dy}{dt} - 2x - 5y = 0$. **(06 Marks)**

   b. Solve $x^2\dfrac{d^2y}{dx^2} + 4x\dfrac{dy}{dx} + 2y = e^x$. **(07 Marks)**

   c. Solve $y = 2px + y^2p^3$ by solving for x. **(07 Marks)**

4. a. Solve $(1+x)^2\dfrac{d^2y}{dx^2} + (1+x)\dfrac{dy}{dx} + y = 2\sin(\log(1+x))$. **(06 Marks)**

   b. Solve $\dfrac{dy}{dx} - \dfrac{dx}{dy} = \dfrac{x}{y} - \dfrac{y}{x}$ by solving for P. **(07 Marks)**

   c. Solve $(px - y)(py + x) = a^2 p$ by reducing to Clairaut's form. **(07 Marks)**

PART – C

5. a. From the function $f(x^2 + y^2, z - xy) = 0$ form the partial differential equation. **(06 Marks)**

   b. Derive one dimensional wave equation as $\dfrac{\partial^2 u}{\partial t^2} = c^2 \dfrac{\partial^2 u}{\partial x^2}$. **(07 Marks)**

   c. Evaluate $\displaystyle\int_0^1 \int_{x^2}^{2-x} xy\,dy\,dx$ by changing the order of integration. **(07 Marks)**

6 a. Solve $\dfrac{\partial^2 u}{\partial x \partial y} = \sin x \sin y$ for which $\dfrac{\partial u}{\partial y} = -2\sin y$ when $x = 0$ and $u = 0$ when y is an odd multiple of $\dfrac{\pi}{2}$. **(06 Marks)**

   b. Derive one dimensional heat equation as $\dfrac{\partial u}{\partial t} = c^2 \dfrac{\partial^2 u}{\partial x^2}$. **(07 Marks)**

   c. Evaluate $\displaystyle\int_{-1}^{1} \int_{0}^{z} \int_{x-z}^{x+z} (x + y + z)\, dy\, dx\, dz$. **(07 Marks)**

PART – D

7 a. Find the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ using double integral. **(06 Marks)**

   b. Evaluate $\displaystyle\int_{0}^{1} \dfrac{dx}{\sqrt{1 - x^4}}$ using beta and gamma functions. **(07 Marks)**

   c. Express the vector $Zi - 2xj + yk$ in cylindrical coordinates. **(07 Marks)**

8 a. Find the volume of the solid bounded by the planes $x = 0$, $y = 0$, $x + y + z = 1$ and $z = 0$ using triple integral. **(06 Marks)**

   b. Evaluate $\displaystyle\int_{0}^{\pi/2} \sqrt{\sin\theta}\, d\theta \times \int_{0}^{\pi/2} \dfrac{d\theta}{\sqrt{\sin\theta}}$ using beta and gamma functions. **(07 Marks)**

   c. Express the vector field $2yi - zj + 3xk$ in spherical polar coordinate system. **(07 Marks)**

PART – E

9 a. Find the Laplace transform of $te^{-4t}\sin 3t$ and $\dfrac{e^{at} - e^{-at}}{t}$. **(06 Marks)**

   b. Express $f(t)$ in terms of unit step function and find its Laplace transform given that
   $$f(t) = \begin{cases} t^2, & 0 < t < 2 \\ 4t, & 2 < t < 4 \\ 8, & t > 4 \end{cases}$$ **(07 Marks)**

   c. Find $L^{-1}\left\{ \dfrac{1}{(s+1)(s^2+9)} \right\}$ using convolution theorem. **(07 Marks)**

10 a. A periodic function $f(t)$ with period 2 is defined by $f(t) = \begin{cases} t, & 0 < t < 1 \\ 2 - t, & 1 < t < 2 \end{cases}$ find $L\{f(t)\}$. **(06 Marks)**

   b. Find $L^{-1}\left\{ \dfrac{5s - 2}{3s^2 + 4s + 8} + \log\left(\dfrac{1}{s^2} - 1 \right) \right\}$. **(07 Marks)**

   c. Solve using Laplace transform method $\dfrac{d^2 y}{dt^2} + 2\dfrac{dy}{dt} + y = te^{-t}$ with $y(0) = 1$, $y^1(0) = -2$. **(07 Marks)**

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