I / II

USN | | | | | | | | | | 　　　　　　　　　　　　　　　　　　　　10MAT11

First Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics – I

Time: 3 hrs. 　　　　　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

Note: *Answer any FIVE full questions, choosing at least two from each part.*

PART – A

1　a.　Choose the correct answers for the following :　　　　　　　　　(04 Marks)

　　i)　The nth derivative of $\cos^2 x$ is

　　　　A) $2^n \cos\left(2x + \dfrac{n\pi}{2}\right)$ 　　　　　　　　B) $2^{n-1} \cos\left(2x + \dfrac{n\pi}{2}\right)$

　　　　C) $2^{n-1} \cos(2x + n\pi)$ 　　　　　　　　D) $2^{n-1} \cos\left(\dfrac{n\pi}{2}\right)$

　　ii)　The Maclaurin's series of $f(x) = K$ (constant) is

　　　　A) $f(x) = K$　　　　B) $f(x) = 0$　　　　C) does not exist　　　D) $f(x) = K!$

　　iii)　The value of C of the Cauchy mean value theorem for $f(x) = e^x$ and $g(x) = e^{-x}$ in $[4, 5]$ is

　　　　A) $\dfrac{5}{2}$ 　　　　　B) $\dfrac{3}{2}$ 　　　　　C) $\dfrac{9}{2}$ 　　　　　D) $\dfrac{1}{2}$

　　iv)　The nth derivative of $y = x^{n-1}.\log x$ is

　　　　A) $y_n = \dfrac{n!}{x}$ 　　　B) $y_n = \dfrac{(n+1)!}{x}$ 　　　C) $y_n = \dfrac{(n-1)!}{x}$ 　　　D) $y_n = \dfrac{n!}{x^2}$

　b.　If $x = \tan(\log y)$, prove that $(1 + x^2)y_{n+1} + (2nx - 1)y_n + n(n-1)y_{n-1} = 0$.　(06 Marks)

　c.　Expand $\log(\sec x)$ by Maclaurin's series expansion upto the term containing x^4.　(05 Marks)

　d.　State and prove Lagrange's mean value theorem.　(05 Marks)

2　a.　Choose the correct answers for the following :　　　　　　　　　(04 Marks)

　　i)　$\displaystyle\lim_{x\to\infty}\left[a^{1/x} - 1\right] x$ is of the following form

　　　　A) $0 \times \infty$ 　　　　B) ∞° 　　　　C) 0^{∞} 　　　　D) $\infty - \infty$

　　ii)　If S is the arc length of the curve $x = g(y)$ then $\dfrac{ds}{dy}$ is

　　　　A) $\sqrt{1 + y_1}$ 　　　　　　　　　　　B) $\sqrt{1 + y_1^2}$

　　　　C) $\sqrt{\left(\dfrac{dy}{dx}\right)^2 + \left(\dfrac{dx}{dy}\right)^2}$ 　　　　D) $\sqrt{1 + \left(\dfrac{dx}{dy}\right)^2}$

　　iii)　The angle between radius vector and the tangent for the curve $r = a(1 - \cos\theta)$ is

　　　　A) $\dfrac{\theta}{2}$ 　　　　　B) $-\dfrac{\theta}{2}$ 　　　　C) $\dfrac{\pi}{2} + \theta$ 　　　　D) $\dfrac{\pi}{2} - \dfrac{\theta}{2}$

　　iv)　Two polar curves are said to be orthogonal if

　　　　A) $\phi_1 \cdot \phi_2 = 0$ 　　　　　　　　B) $\tan\phi_1 \cdot \tan\phi_2 = -1$

　　　　C) $\dfrac{\phi_1}{\phi_2} = \dfrac{\pi}{2}$ 　　　　　　　D) $\phi_1 \cdot \phi_2 = -1$

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b. If $y = \dfrac{ax}{a+x}$, then show that $\left(\dfrac{2\rho}{a}\right)^{2/3} = \left(\dfrac{y}{x}\right)^2 + \left(\dfrac{x}{y}\right)^2$ where ρ is the radius of curvature at any point (x, y). **(06 Marks)**

c. Evaluate $\displaystyle \lim_{x \to 0} \left[\dfrac{\sin x}{x}\right]^{\frac{1}{x^2}}$. **(05 Marks)**

d. Derive an expression for the radius of curvature in polar form. **(05 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**

i) If $z = x^2 + y^2$ then $\dfrac{\partial^2 z}{\partial x \partial y}$ is equal to

    A) 0   B) 2   C) 2y   D) 2x

ii) The Taylor's series of f(x, y) = xy at (1, 1) is

    A) $1 + [(x-1)+(y-1)]$ B) $1 + [(x-1)+(y-1)] + [(x-1)(y-1)]$

    C) $(x-1)(y-1)$ D) None of these

iii) If $z = f(x, y)$ then the relative error in z is

    A) $\dfrac{\delta z}{x}$ B) $\delta z - y$ C) $\dfrac{\delta z}{z}$ D) $z - \delta z$

iv) If $x = r\cos\theta$, $y = r\sin\theta$ then $\dfrac{\partial(r, \theta)}{\partial(x, y)}$ is

    A) r   B) $\dfrac{1}{r}$ C) 1   D) -1

b. Find the extreme values of $f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$. **(06 Marks)**

c. If $x = r\cos\theta$, $y = r\sin\theta$, prove that $\dfrac{\partial^2 r}{\partial x^2} + \dfrac{\partial^2 r}{\partial y^2} = \dfrac{1}{r}\left[\left(\dfrac{\partial r}{\partial x}\right)^2 + \left(\dfrac{\partial r}{\partial y}\right)^2\right]$. **(05 Marks)**

d. The diameter and altitude of a can in the form of a right circular cylinder are found to be 4.5 cms and 8.25 cms respectively. The possible error in each measurement is 0.1 cm. Find the approximate error in the volume and lateral surface area. **(05 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

i) The gradient, divergence, curl are respectively

    A) scalar, scalar, vector   B) vector, scalar vector

    C) scalar, vector, vector   D) vector, vector, scalar

ii) $\vec{F} = y^2 z\hat{i} + z^2 x\hat{j} + x^2 y\hat{k}$ is

    A) constant vector   B) solenoidal   C) scalar   D) none of these

iii) curl grad ϕ is

    A) grad curl ϕ B) curl grad ϕ + grad curl ϕ

    C) zero   D) does not exist

iv) If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ then curl $\vec{r}$ is

    A) 0   B) 1   C) -1 D) ∞

b. If $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$, find $\text{div}\vec{F}$ and $\text{curl}\vec{F}$. **(06 Marks)**

c. Prove that $\text{curl}(\phi\vec{F}) = \phi\,\text{curl}\vec{F} + \text{grad}\,\phi \times \vec{F}$. **(05 Marks)**

d. Prove that the cylindrical coordinate system is orthogonal. **(05 Marks)**

PART – B

5 a. Choose the correct answers for the following :   (04 Marks)

i)   The value of the integral $\int\limits_{0}^{\pi/2} \sin^7 x\, dx$ is

    A) $\dfrac{35}{16}$ B) $\dfrac{16}{35}$ C) $-\dfrac{16}{35}$ D) $\dfrac{18}{35}$

ii) $x^2 + y^2 = x^2 y^2$ is symmetric about

    A) x - axis   B) y - axis   C) y = x   D) All A, B, C

iii) The value of $\int\limits_{0}^{\pi} \sin^4 x\, dx$ is

    A) $\dfrac{3\pi}{8}$ B) $\dfrac{3}{8}$ C) $\dfrac{\pi}{16}$ D) $\dfrac{\pi}{4}$

iv) Asymptote to the curve $y^2(a - x) = x^3$ is

    A) y = 0   B) x = 0   C) x = a   D) none of these

b. Evaluate $\int\limits_{0}^{1} \dfrac{x^\alpha - 1}{\log x}\, dx$, $\alpha \geq 0$ using differentiation under integral sign, find $\int\limits_{0}^{1} \dfrac{x^3 - 1}{\log x}\, dx$.

(06 Marks)

c. Obtain reduction formula for $\int\limits_{0}^{\pi/2} \cos^n x\, dx$.   (05 Marks)

d. Find the surface area generated by an arch of the cycloid $x = a(\theta - \sin\theta)$, $y = a(1 - \cos\theta)$ about the x-axis.   (05 Marks)

6 a. Choose the correct answers for the following :   (04 Marks)

i)   For the differential equation $\left[\dfrac{d^3 y}{dx^3}\right]^2 + \left[\dfrac{d^2 y}{dx^2}\right]^6 + y = x^4$ the order and degree respectively are

    A) 2, 6   B) 3, 2   C) 2, 4   D) none of these

ii) The solution of the differential equation $\dfrac{dy}{dx} = e^{x+y}$ is

    A) $e^x + e^{-y} = c$ B) $e^{-x} + e^{-y} = c$ C) $e^x + e^y = c$ D) $e^{x+y} = c$

iii) The integrating factor of the differential equation $\dfrac{dx}{dy} + Px = Q$ where P, Q are functions Y is

    A) $e^{\int p\,dy}$ B) $e^{\int p\,dx}$ C) $e^{\int Q\,dy}$ D) none of these

iv) If the differential equation of the given family remains unaltered after replacing $\dfrac{dy}{dx}$ by $-\dfrac{dx}{dy}$ then given family of curves is said to be

    A) not orthogonal   B) self orthogonal   C) reciprocal   D) none of these

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

c. Solve $\left[x\tan\left(\dfrac{y}{x}\right) - y\sec^2\left(\dfrac{y}{x}\right)\right]dx + x\sec^2\left(\dfrac{y}{x}\right)dy = 0$.   (05 Marks)

d. Find the orthogonal trajectory of $r^n = a^n \sin n\theta$.   (05 Marks)

7 a. Choose the correct answers for the following :   (04 Marks)
   i)   Which of the following is not an elementary transformation
        A) adding two columns   B) adding two rows
        C) squaring all elements of the matrix   D) multiplying a row by a non-zero number
   ii) The exact solution of the system of equations $10x + y + z = 12$, $x + 10y + z = 12$, $x + y + 10z = 12$ by inspection is
        A) (-1, 1, 1)   B) (-1, -1, -1)   C) (1, 1, 1)   D) (0, 0, 0)
   iii) If r is the rank of the matrix [A] of order m × n then r is
        A) r ≤ minimum of (m, n)   B) r ≤ n
        C) r > n   D) r ≥ m
   iv) Which of the following is in the normal form

   A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ B) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ C) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ D) all of these

   b. Find the rank of the following matrix by reducing it to the normal form
       $$A = \begin{bmatrix} 0 & 1 & 2 & -2 \\ 4 & 0 & 2 & 6 \\ 2 & 1 & 3 & 1 \end{bmatrix}$$ (06 Marks)

   c. Find the value of K such that the following system equations possess a non-trivial solution
       $4x + 9y + z = 0$, $Kx + 3y + Kz = 0$, $x + 4y + 2z = 0$.   (05 Marks)

   d. Solve the following system of equations by Gauss Jordan method:
       $x + y + z = 9$, $x - 2y + 3z = 8$, $2x + y - z = 3$ (05 Marks)

8 a. Choose the correct answers for the following :   (04 Marks)
   i)   A square matrix A is called orthogonal if
        A) $A = A^2$ B) $A^1 = A$ C) $AA^1 = I$ D) none of these
   ii) The eigen values of the matrix A exist if
        A) A is a square matrix   B) A is singular matrix
        C) A is any matrix   D) A is null matrix
   iii) The matrix of the quadratic form $a_{11}x_1^2 + 2a_{12}x_1x_2 + a_{22}x_2^2$ is
        A) $\begin{bmatrix} a_{11} & a_{12} \\ a_{12} & a_{11} \end{bmatrix}$ B) $\begin{bmatrix} a_{11} & a_{12} \\ a_{12} & a_{22} \end{bmatrix}$ C) $\begin{bmatrix} 1 & a_{11} \\ a_{11} & 1 \end{bmatrix}$ D) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
   iv) If the eigen vector is (1, 1, 1) then its normalized form is
        A) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ B) $\left(\frac{1}{\sqrt{2}}, 0, -\frac{1}{\sqrt{2}}\right)$ C) $\left(-\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}\right)$ D) $\left(-\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$

   b. Find the eigen values and eigen vector corresponding to the largest eigen value of the matrix
       $$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$ (06 Marks)

   c. Diagonalize the matrix, $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.   (05 Marks)

   d. Reduce the quadratic form $x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 8x_2x_3$ into sum of squares.   (05 Marks)

First/Second Semester B.E. Degree Examination, June/July 2017
Engineering Physics

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Physical constants: $h = 6.625 \times 10^{-34}$, J-S, $C = 3 \times 10^8\ ms^{-1}$, $m_e = 9.1 \times 10^{-31} kg$, $L = 1.38 \times 10^{-23} Fm^{-1}$,*
$\in_0 = 8.854 \times 10^{-12} Fm^{-1}$, $e = 1.6 \times 10^{-19} C$, Avogadro number $N_A = 6.025 \times 10^{26}$/K mole.

PART – A

1   a.   Choose the correct answers for the following :

     i)   The associated wavelength of an electron beam is acceleration from rest through a potential difference of 200V is

        A) $0.868\,\mathring{A}$ B) $0.0868\,\mathring{A}$ C) $0.969\,\mathring{A}$ D) $0.0969\,\mathring{A}$

     ii)   In blackbody radiation spectrum, with increase of temperature the maximum intensity position shift towards.
        A) Shorter wavelength   B) longer wavelength
        C) Entire wavelength   D) no change.

     iii)   Davisson and Germer succeeded in their experiment in proving
        A) Bragg's law   B) Particle nature of electrons
        C) Wave nature of electrons   D) That nickel is a crystal

     iv)   Einstein's photo electric equation is given by
        A) $\frac{1}{2}mV_{max}^2 = h\gamma - \phi$ B) $\frac{1}{2}mV_{max}^2 = h\gamma + \phi$ C) $\frac{1}{2}mV_{max}^2 = h\gamma - h_1$ D) None of these

                                                     (04 Marks)

  b.   What is Plank's radiation law? Show that Planck's law reduces to Wien's law and Rayleigh Jeans law.   **(06 Marks)**

  c.   Define phase velocity and group velocity and derive a relation between them.   **(06 Marks)**

  d.   Estimate the potential difference through which a proton is needed to be accelerated so that its de Broglie wavelength becomes equal to $1\,\mathring{A}$, given mass of proton is $1.673 \times 10^{27} kg$.   **(04 Marks)**

2   a.   Choose the correct answers for the following :

     i)   The energy required for an electron to jump from ground state to the second excited state in a potential well of width L is

        A) $E = \frac{h^2}{mL^2}$ B) $E = \frac{h^2}{4mL^2}$ C) $E = \frac{h^2}{8mL^2}$ D) $\frac{2h^2}{mL^2}$

     ii)   According to max Born's interpretation, $|\psi|^2$ represents
        A) probability density   B) Energy density
        C) Particle density   D) Charge density.

     iii)   A wave function is an acceptable wave function if it is
        A) Finite every where   B) Continuous every where
        C) Single valued every where   D) All of these.

     iv)   If the uncertainty in momentum is large, the uncertainty in wavelength is
        A) Small   B) Large   C) Zero   D) None of these
                                                        (04 Marks)

b. Obtain the time independent Schrödinger wave equation, in one dimension. **(07 Marks)**

c. State and explain Heisenberg's uncertainty principle. **(04 Marks)**

d. An electron and a 150×10^{-3} Kg base ball are travelling at a velocity of 220m/s, measured to an accuracy of 0.005%. Calculate uncertainty in position of each. **(05 Marks)**

3 a. Choose the correct answers for the following :

i) The free electrons in classical free electron theory are treated as
  A) rigidly fixed lattice points   B) Gas molecules
  C) Liquid molecules   D) None of these.

ii) The electron mobility in a solid is

  A) $\mu = \dfrac{V_d}{E}$ B) $\mu = V_d E$ C) $\mu = \dfrac{V_d}{L}$ D) $\mu = V_d L$

iii) The Fermienergy of a metal at absolute zero temperature is proportional to
  A) $n^{1/3}$ B) $n^{3/2}$ C) $n^{2/3}$ D) n^2

iv) The collision time and root mean square velocity of an electron at room temperature are 3×10^{-14} s and 1×10^{5} m/s respectively. The classical value of mean free path of the electron is
  A) 3×10^{-19}m   B) 3×10^{-10}m   C) 3×10^{-9}m   D) 3×10^{19}s
  (04 Marks)

b. Using the free electron theory, derive an expression for electrical conductivity in metals. **(06 Marks)**

c. Discuss the dependence of Fermic factor on temperature. **(06 Marks)**

d. Calculate the Fermienergy of sodium at 0K assuming that it has one free electron per atom and density of sodium is 970kg/m^3 and atomic weight 23. **(04 Marks)**

4 a. Choose the correct answers for the following :

i) If the radius of hydrogen atom is 0.053×10^{-9}m, then its electronic polarizability is
  A) 1.656×10^{-41}Fm^2 B) 3.035×10^{-40}Fm^2 C) 5.9×10^{-21}Fm^2 D) 16.56×10^{-41}Fm^2

ii) The polarization mechanism that depends on temperature is
  A) Electronic   B) ionic   C) orientational   D) Space charge

iii) The relative permeability for diamagnetic materials is
  A) > 1 B) < 1 C) $= 1$ D) Zero

iv) Piezoelectric effect is used to convert _____ energy into _____ energy.
  A) Mechanical, electrical   B) Electrical, mechanical
  C) Electrical, light   D) None of these.   **(04 Marks)**

b. Define dielectric polarization. Discuss different types of polarization mechanics. **(07 Marks)**

c. Compare soft and hard magnetic materials on the basis of hysteresis curve, Give example and applications for each type. **(05 Marks)**

d. The dielectric constant of sulphur is 3.4. Assuming a cubic lattice for its structure, calculate the electronic polarizability of sulphur. The atomic weight and density of suplhur are 32.07 and 2.07×10^{3} kg/m^3 respectively. **(04 Marks)**

PART – B

5 a. Choose the correct answers for the following :

i) The ratio of Einstein's spontaneous and stimulated emission coefficients is

  A) $\dfrac{8\pi h\lambda^3}{C^3}$ B) $\dfrac{8\pi h\gamma^3}{C^3}$ C) $\dfrac{8\pi h\gamma^2}{C^2}$ D) $\dfrac{8\pi h\lambda^2}{C^2}$

ii) The process of producing population inversion is known as
  A) absorption   B) emission   C) pumping   D) None of these

iii) Active centre of He –Ne gas loses

    A) Ne   B) He   C) Bothe Ne and He   D) None

iv) Image is stored on a hologram in the form of

    A) interference pattern   B) diffraction pattern

    C) polarization   D) photography   **(04 Marks)**

    Describe the construction and working of He-Ne laser.   **(07 Marks)**

b. What is holography? Explain the recording process in holography.   **(05 Marks)**

c. A He-Ne laser emits photons of wavelength 632.8nm with 1mW average power per pulse.

d. Calculate the number of photons emitted per second.   **(04 Marks)**

6   a. Choose the correct answers for the following :

    i) In an Optical fibre, the core material has refractive index 1.43 and refractive index of clad material is 1.4, the numerical operator is

        A) 0.92   B) 0.29   C) 0.97   D) 0.77

    ii) The relation between numerical aperture and fractional index change is

        A) $NA = n_1\sqrt{2\Delta}$ B) $NA = \Delta\sqrt{2n_1}$ C) $NA = \Delta n_1\sqrt{2n_1}$ D) $NA = 2n_1\sqrt{\Delta}$

    iii) The variation of critical field H_c with temperature T is given by

        A) $H_c = H_0\left[1-\left(\dfrac{T}{T_c}\right)^2\right]$ B) $H_c = H_0\left[1+\left(\dfrac{T}{T_c}\right)^2\right]$

        C) $H_c = H_0\left[1-\left(\dfrac{T}{T_c}\right)\right]$ D) $H_c = H_0\left[1+\left(\dfrac{T}{T_c}\right)\right]$

    iv) Superconductors in superconducting state behaves as

        A) Ferromagnetic material   B) Diamagnetic materials

        C) Dielectric material   D) Monovalent material.   **(04 Marks)**

b. Discuss the different types of optical fibres with suitble diagrams.   **(06 Marks)**

c. Define superconductivity and explain Type I and Type II superconductors.   **(06 Marks)**

d. A step index optical fibre has a core index of 1.46 and the cladding index of 1.409. If the core diameter is 80μm, and the wavelength of light source is 1.2μm, determine the number of modes present in the fibre.   **(04 Marks)**

7   a. Choose the correct answers for the following :

    i) Lead exhibits FCC structure. Each side of the unit cell is of 4.95 $\overset{\circ}{A}$, the radius of a lead atom is

        A) 1.75 $\overset{\circ}{A}$ B) 1.57 $\overset{\circ}{A}$ C) 1.075 $\overset{\circ}{A}$ D) 1.057 $\overset{\circ}{A}$

    ii) The miller indices of the place parallel to X and Y axes are

        A) (100)   B) (010)   C) (001)   D) (111)

    iii) The lattice constant of a cubic crystal is given by

        A) $a = d_{hk\ell}\sqrt{h^2+k^2+\ell^2}$ B) $a = \dfrac{d_{hk\ell}}{\sqrt{h^2+k^2+\ell^2}}$

        C) $a = \dfrac{\sqrt{h^2+k^2+\ell^2}}{d_{hk\ell}}$ D) None of these.

    iv) The grating space of calcite is 3.036 $\overset{\circ}{A}$. The wavelength of X-rays that undergo first order reflection at a glancing angle of 12° is

        A) 1.262 $\overset{\circ}{A}$ B) 1.626 $\overset{\circ}{A}$ C) 1.541 $\overset{\circ}{A}$ D) 1.145 $\overset{\circ}{A}$

                                                                      (04 Marks)

b. What are miller indices? Explain procedure to find miller indices with an example. (05 Marks)

c. Describe how Bragg's X-ray spectrometer is used to determine the wavelength of an X-ray beam. (06 Marks)

d. Monochromatic X-rays of wavelength 0.82 Å undergo first order Bragg reflection from a crystal of cubic lattice with lattice constant 3 Å, at a glancing angle of 7.855°. Indentify the possible planes which give rise to this reflection in terms of their miller indices. (05 Marks)

8 a. Choose the correct answers for the following :
   i) The nanostructure reduced in only one direction is known as
      A) quantum dot   B) Quantum wire   C) film   D) Quantum will
   ii) The signal due to a reflected wave is called
      A) transmitted wave   B) longitudinal wave   C) echo   D) peaco
   iii) The elastic behavior of a liquid is characterized by its
      A) Young's modulus   B) Bulk modulus
      C) Rigidity modulus   D) Poisson's ratio
   iv) An acoustic grating can be made by
      A) Setting up a standing wave pattern in a liquid using ultrasonic's
      B) Subjecting an optical grating to pressure waves of ultrasonic frequency.
      C) Drawing lines on a glass plate at equal width
      D) It is only a theoretical concept. (04 Marks)

b. Write a note on nanotechnology. (04 Marks)

c. Write a note on fullerene with applications. (06 Marks)

d. Describe a method of measuring velocity of ultrasonic waves in a liquid. (06 Marks)

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First/Second Semester B.E. Degree Examination, June/July 2017
Engineering ~~Physics~~ CHEMISTRY

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, choosing at least two from each part.*

PART – A

1 a. Choose the correct answers for the following :
   i) Calomel electrode produces a potential of ± 0.2422 Volt where filled with
      A) Sat.ku   B) 1N ku   C) 1 M ku   D) 0.1N ku
   ii) Voltameter in an electrochemical cell is used to measure
      A) Concentration   B) Voltage   C) Current   D) None of these.
   iii) Glass electrode cannot be used in the presence of fluoride ions because
      A) Alkaline error   B) Loss its activity
      C) Glass membrane dissolves   D) None of these
   iv) The potential of the standard hydrogen electrode is taken as
      A) 1 Volt   B) 0 Volt   C) 10 Volt   D) None of these
                                                                  (04 Marks)

   b. Define single electrode potential. Derive Nerst's equation for single electrode potential
                                                                  (06 Marks)

   c. Define the terms : i) Galvanic cell   ii) Concentration cell   iii) Reference electrode. Give
       an example each.   **(06 Marks)**

   d. Calculate the emf of Li-Aℓ cell

       $\underset{(s)}{Li}\Big|Li^+(0.12M)\Big|\Big|A\ell^{3+}(0.15M)\Big|\underset{(s)}{A\ell}$ at 298K if the standard reduction potential of lithium

       electron is $-3.05V$ and aluminium electrode is $-1.66V$.   **(04 Marks)**

2 a. Choose the correct answers for the following :
   i) The electrolyte used in Li-MnO$_2$ battery is
      A) 30y. H_2SO_4 B) 60M KOH
      C) Li – halide and organic solvents   D) $NH_4u + Z_nu_2$
   ii) Which of the following is used in cellular phones?
      A) Zn – MnO$_2$ B) Zn – Air   C) Pb – acid   D) Ni – MH
   iii) The electrolyte used in Zn – Air battery
      A) aq.H_2SO_4 B) aq. KOH   C) Con Ku   D) None of these
   iv) Which of the following is a reserve battery?
      A) Zn – Air battery B) Ni – MH battery C) Zn – Ag$_2$O   D) Li – MnO$_2$
                                                                  (04 Marks)

   b. Describe the construction and working of lead acid battery.   **(06 Marks)**
   c. What are fuel cells? Describe the construction and working of a $H_2 - O_2$ fuel cell. **(06 Marks)**
   d. Discuss the battery characteristics: i) Capacity   ii) Cycle life.   **(04 Marks)**

3 a. Choose the correct answers for the following :
   i) Impressed current method of preventing corrosion is
      A) Anodic protection   B) Cathodic Protection
      C) Both (A) and (B) D) None of these.

ii) Galvanized nuts and bolts is an example of
   A) Cathodic coating   B) Impressed current method
   C) Corrosion inhibition   D) Anodic coating.

iii) When the ratio of anodic area to the cathodic area increases, the rate of corrosion.
   A) Decreases   B) Increases   C) attains constancy   D) None of these.

iv) Caustic embrittlment is a classic example of
   A) Differential aeration corrosion   B) Stress corrosion
   C) Differential metal corrosion   D) None of these.   **(04 Marks)**

b. Define the term corrosion. Explain the electron chemical theory with reference of iron.   **(06 Marks)**

c. Explain the following types of corrosion i) Pitting corrosion ii) Water line corrosion.   **(06 Marks)**

d. Explain the following factors influence on the rate of corrosion
i) Nature of the corrosion product   ii) Hydrogen overvoltage.   **(04 Marks)**

4 a. Choose the correct answers for the following :
i) Throwing power is higher in the case of
   A) Electroplating process   B) Electro less plating process
   C) Both (A) and (B)   D) None of these.

ii) Reducing agent used in electro-less plating of copper is
   A) EDTA   B) Formaldehyde   C) Sodium Hypophosphite   D) None of these.

iii) Gold plating in printed circuit boards is done using
   A) Neural cyanide bath   B) Alkaline cyanide bath
   C) Acid cyanide bath   D) None of these.

iv) IN electroplating of chromium the anode used is
   A) Chromium   B) Pb-Sb alloy   C) Nickel   D) Copper.   **(04 Marks)**

b. Explain the following factors influencing the rate of electro-deposit
i) Temperature   ii) Current density   iii) Wetting agent.   **(06 Marks)**

c. Discuss the process of electroless plating of nickel. Mention its applications   **(06 Marks)**

d. What is electroplating? Mention any three advantages of electroless plating over electroplating.   **(04 Marks)**

PART – B

5 a. Choose the correct answers for the following :
i) The chemical name of biodiesel is
   A) Monoalkyl fatty ester   B) Fatty acids
   C) Triglycerides   D) None of these.

ii) Catalyst used in catalytic converter are
   A) Pt, Pd and Rh   B) Ni, ℓo and Cr   C) Al_2O_3 and SiO_2 D) None of these.

iii) If the percentage of hydrogen in a fuel is, low its net calorific value is
   A) High   B) Low   C) Constant   D) None of these.

iv) Which of the following is not a secondary fuel
   A) Natural gas   B) Coal gas   C) Water gas   D) Producer gas   **(04 Marks)**

b. What is meant by cracking? Describe the fluidized bed catalytic cracking process. **(06 Marks)**

c. What is PV-cell? Explain the construction and working of PV-Cell. Mention its advantages.   **(06 Marks)**

d. How much rise in temperature of water occurs when 0.75g of a fuel is burnt a bomb calorimeter containing 2.5kg of water. If the gross calorific values of the fuel is 4500kJ/kg and water equivalent of calorimeter is 0.65kg. Given S = 4.187 kJ/kg/°C.   **(04 Marks)**

6 a. Choose the correct answers for the following :

i) In a filtration of strong acid verses strong base conductivity
 A) Increases
 B) Decreases
 C) Increases and then decreases
 D) Decreases and then increases.

ii) Lambert's law states that intensity of monochromatic light decrease exponentially
 A) Concentration
 B) Path length
 C) Time
 D) Density.

iii) Flame photometer is based on
 A) Atomic absorption
 B) Molecular absorption
 C) Atomic emission
 D) All of above

iv) Gibb's phase rule is applicable to
 A) Heterogeneous systems
 B) Heterogeneous system in equilibrium
 C) Homogeneous system
 D) All the above   **(04 Marks)**

 b. Draw the phase diagram for water system, explain and calcualte the number of degree of freedom on a line, in a area and at triple point.   **(06 Marks)**

 c. What are potentiometric filtrations? Discus the application of potentiometry on the estimation of FAS using std $K_2Cr_2O_7$ solution.   **(06 Marks)**

 d. Mention the advantages of conductometric filtration.   **(04 Marks)**

7 a. Choose the correct answers for the following :

i) Which of the following is an adhesive
 A) Neoprene
 B) Bakelite
 C) Plexiglass
 D) Araldite

ii) The monomer for neoprene is
 A) Isoprene
 B) Chloroprene
 C) Epichlorophydrin
 D) Bisphenol – A.

iii) Kelvar is a
 A) Polyurethanes
 B) Polycarbonates
 C) Polystyrene
 D) Polyamide.

iv) Benzoyl peroxide is used as
 A) Inhibitor
 B) Terminator
 C) Propagator
 D) Chain transfer agent   **(04 Marks)**

 b. Define glass transition temperature. Explain the following factors affecting Tg. Value.
 i) Flexibility   ii) Molecular weight.   **(06 Marks)**

 c. What are conducting polymers? Explain the mechanism of conduction poly acetylene by oxidative doping (P-type).   **(06 Marks)**

 d. How are the following polymers synthesized   i) Teflow   ii) PMMA.   **(04 Marks)**

8 a. Choose the correct answers for the following :

i) Complexing agent for spectrochemical analysis of nitrates
 A) SPADNA
 B) Ammonia
 C) Phenol sulphonic acid
 D) Phenol disulphonic acid

ii) A treatment involving the removal of phosphate is
 A) Primary
 B) Secondary
 C) Tertiary
 D) None of these.

iii) The indicator used in the determination of chloride content of water sample by Mohr's method.
 A) Phenolphthalein
 B) Potassium chromatic
 C) Starch
 D) Ferroiw

iv) Permanent hardness of water is caused due to the presence of
 A) Calcium carbonate
 B) Calcium chloride
 C) Calcium bicarbonate
 D) All the above.   **(04 Marks)**

 b. Explain the gravimetric method of determination of suphate content in water.   **(06 Marks)**

 c. What is desalination? Explain the desalination of water by reverse osmosis.   **(06 Marks)**

 d. Explain the activated sludge process.   **(04 Marks)**

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First/Second Semester B.E. Degree Examination, June/July 2017
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, choosing at least two from each part.*

PART – A

1 a. Choose the correct answers for the following :
      i) Geotechnical Engineering involves the study of _____.
          A) Air   B) Highway   C) Soil   D) Dams
      ii) Bascule bridge is a _____ bridge.
          A) Floating   B) Movable   C) Arch   D) Suspension
      iii) Reinforced cement concrete (RCC) comes under _____.
          A) Structural Engineering   B) Geotechnical Engineering
          C) Transportation Engineering   D) Hydraulics
      iv) Kerbs are components of _____.
          A) Bridges   B) Buildings   C) Dams   D) Roads.   **(04 Marks)**
  b. What are the purposes of dams? List out any four types.   **(06 Marks)**
  c. Explain briefly the scope of civil engineering in the following :
      i) Geotechnical engineering   ii) Environmental engineering.   **(10 Marks)**

2 a. Choose the correct answers for the following :
      i) Effect of force on a body depends on _____.
          A) Direction   B) Position   C) Magnitude   D) All of these.
      ii) In a tug of war, two opposing teams are pulling the rope with equal and opposite forces of 1000N at each end. The tension in the rope is _____.
          A) 0   B) 1000N   C) 2000N   D) $1000\sqrt{2}$ N.
      iii) In coplanar concurrent force system, if $\sum H = 0$, then the direction of resultant is ____.
          A) Horizontal   B) Moment   C) Vertical   D) None of these.
      iv) The magnitude of the moment is ___ when a force is applied perpendicular to the lever.
          A) Zero   B) Negative   C) Minimum   D) Maximum.
                                                       (04 Marks)
  b. State and explain basic principles of idealization in engineering mechanics.   **(06 Marks)**
  c. Four Coplanar forces acting at a point are as shown in Fig Q2(c) out of which one of the forces in unknown whose magnitude is "F". If the resultant is 250N acting along X axis, determine the magnitude of unknown force "F" and its direction "θ".   **(10 Marks)**
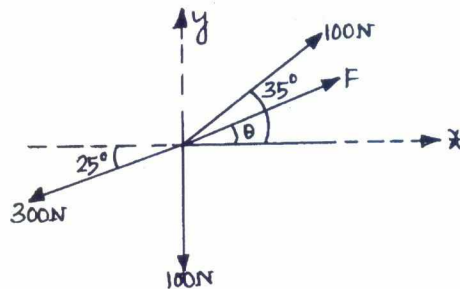

Fig. Q2(c)

3 a. Choose the correct answers for the following :
      i) The method of finding the resultant of a system of forces is called _____.
          A) Resultant   B) Resolution   C) Composition   D) None.

ii) Varignon's theorem is not applicable for _____ force system.
    A) Coplanar non-concurrent   B) Non-coplanar non-concurrent
    C) Concurrent   D) Parallel.

iii) In a coplanar concurrent force system, if $\sum V = 0$, then the resultant is ____.
    A) Horizontal   B) Vertical   C) Moment   D) None.

iv) If two forces of magnitude $\frac{P}{2}$ act at right angles to each other, then their resultant is __.

    A) 2P   B) $P\sqrt{2}$ C) $\frac{P}{\sqrt{2}}$ D) $\frac{P}{2}$.   **(04 Marks)**

b. State and prove the principle of moments. **(08 Marks)**

c. Find the resultant and direction of the coplanar force system acting on a body OABC as shown in Fig. Q3(c). Also find the points where the resultant will cut the X and Y axis.
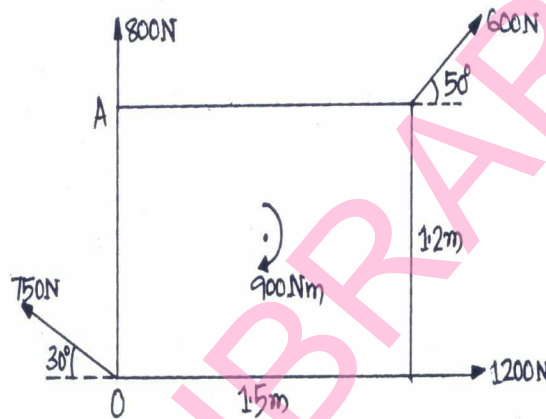

Fig. Q3(c)   **(08 Marks)**

4 a. Choose the correct answers for the following :
i) The moment of total about the centroidal axis is _____.
    A) Zero   B) Twice the area   C) Thrice the area   D) None.

ii) The co-ordinates of the centroid of the right angled triangle shown in Fig. Q4(a)(ii) is ___.

    A) $\left(\frac{b}{3}, \frac{h}{3}\right)$ B) $\left(\frac{2b}{3}, \frac{h}{3}\right)$ C) $\left(\frac{b}{3}, \frac{2h}{3}\right)$ D) $\left(\frac{2b}{3}, \frac{2h}{3}\right)$

iii) If a plane Figure is symmetrical about y-y axis, the centrioid their in _____.
    A) X-axis   B) y-y axis   C) Bottom   D) Top.

iv) The centroid of a semicircle of radius R about a centriodal axis parallel to its diametrla axis is _____.

    A) $\frac{3R}{4\pi}$ B) $\frac{3R}{8\pi}$ C) $\frac{4R}{\pi}$ D) $\frac{4R}{3\pi}$ **(04 Marks)**

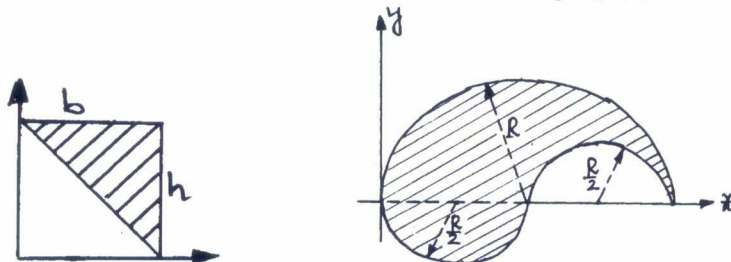b. Locate the centroid for the shaded area as shown in Fig. Q4(b).   **(08 Marks)**

Fig. Q4(a)(ii)   Fig Q4(b)

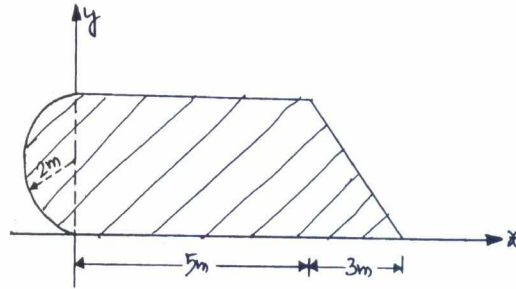c. Determine the centroid of the area shown in Fig. Q4(c)

Fig. Q4(c)   **(08 Marks)**

PART – B

5 a. Choose the correct answers for the following :
   i) Lami's theorem is valid for _____ .
      A) Two current forces in equilibrium   B) Four concurrent forces in equilibrium
      C) Three concurrent forces in equilibrium   D) None.
   ii) A particle is acted upon by two forces of equal magnitude and is in equilibrium. The angle between the two forces is _____ .
      A) Zero   B) 90°   C) 180°   D) 45°
   iii) The force which is equal and opposite to the resultant is _____ .
      A) Resultant force   B) Force   C) Moment   D) Equilibrant.
   iv) In an non-concurrent force system, if $\sum H = 0$ and $\sum V = 0$, then the resultant is ____ .
      A) Positive force   B) Negative force   C) Moment   D) Zero.   **(04 Marks)**

 b. Find the reaction from the inclined plane and tension in string for the arrangement shown in Fig. Q5(b). Take the weight of the ball as 500N.   **(06 Marks)**

 c. The system of connected flexible cabler shown in Fig. Q5(c) in supporting loads 100N and 500N at B and D respectively. Find the tension in various segments.   **(10 Marks)**
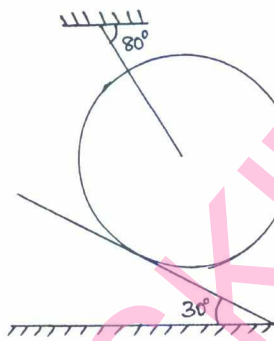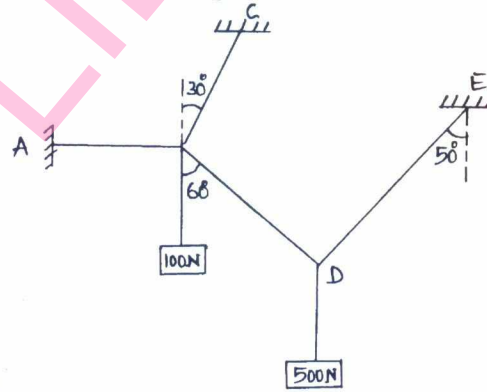

Fig. Q5(b)   Fig Q5(c)

6 a. Choose the correct answers for the following :
   i) At the fixed end of the cantilever beam, the numbers of unknown reactions are _____ .
      A) 1   B) 2   C) 3   D) 4
   ii) The support reaction for statically determinate beams can be determined by applying ___ .
      A) Conditions of static equilibrium   B) Lami's theorem
      C) Varignou's principle   D) None.
   iii) The portion of the beam extending beyond supports is known as _____ beam.
      A) Propped cantilever   B) Continuous   C) Overhanging   D) Cantilever.
   iv) The beam with three or more supports is known as _____ beam.
      A) Cantilever   B) Fixed   C) Propped   D) Continuous.
           (04 Marks)

 b. Explain the different types of supports and loads on the beam with the help of neat sketch.
         (08 Marks)

c. A beam ABCDEF is hinged at A and supported on rollers at E and carries the loads as shown in Fig. Q6(c). Determine the reactions at supports. **(08 Marks)**
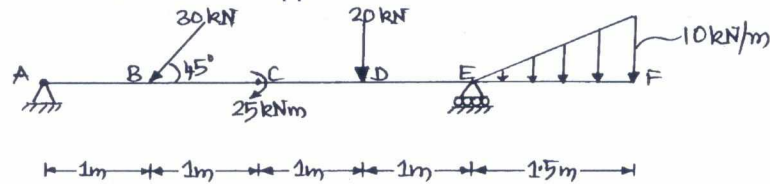

Fig. Q6(c)

7 a. Choose the correct answers for the following :
   i) The frictional force is independent of _____.
      A) Coefficient of friction B) Angle of friction   C) Area of contact   D) None.
   ii) The coefficient of friction depends on _____.
      A) Area of contact   B) Shape and surface   C) Strength of surface D) None.
   iii) The force of friction developed at the contact surface is always ____.
      A) Parallel to the plane and along the direction of applied force
      B) Perpendicular to the plane
      C) Parallel to the plane and opposite to the direction of motion   D) All of these.
   iv) The angle of friction is the angle between _____
      A) Inclined and horizontal surface
      B) The normal reaction and the frictional force
      C) The weight of the body and the frictional force
      D) The normal reaction and the resultant. **(04 Marks)**

b. State the laws of static and dynamic friction. **(08 Marks)**

c. A block weighing 1000N rests on a plane inclined at 20° to the horizontal. If $\mu = 0.25$, find the force required to push the block up the plane when the line of action makes an angle of 30° with the plane as shown in Fig. Q7(c) **(08 Marks)**

8 a. Choose the correct answers for the following :
   i) The moment inertia is a _____.
      A) First moment of area   B) Second moment of area
      C) Third moment of area   D) None.
   ii) The unit of radius of gyration of an area is a _____.
      A) N/m   B) N/m^2 C) m^3 D) m
   iii) The moment of inertia of a circle with 'D' as diameter about its centroidal axis is ___.
      A) $\dfrac{\pi D^2}{32}$ B) $\dfrac{\pi D^2}{64}$ C) $\dfrac{\pi D^4}{32}$ D) $\dfrac{\pi D^4}{64}$
   iv) The moment of inertia of a triangular section about base 'b' and height 'h' is _____.
      A) $\dfrac{bh^3}{36}$ B) $\dfrac{bh^3}{12}$ C) $\dfrac{bh^3}{64}$ D) None. **(04 Marks)**

b. Derive the expression for moment of inertia of a semicircular lamina of radius 'R' about centroidal axis parallel to the diameter. **(06 Marks)**

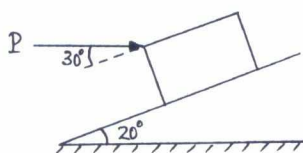c. Determine the moment of inertia about the centroidal axis for a lamina shown in Fig. Q8(c). **(10 Marks)**
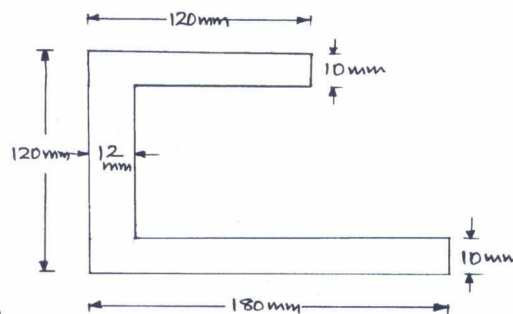

Fig Q7(c)

Fig Q8(c)

* * 4 of 4 * * *

USN ☐☐☐☐☐☐☐☐☐☐   **10CCP13/23**

First/Second Semester B.E. Degree Examination, June/July 2017
Computer Concepts and C Programming

Time: 3 hrs.   Max. Marks:100

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

PART – A

1 a. Choose the correct answers for the following :   **(04 Marks)**
     i) Which of the following device stored instructions that help computer to start up?
         A) Joy stick   B) RAM   C) ROM   D) Monitor
     ii) Who is called the father of computer?
         A) Balise Pascal   B) Charles Babbage
         C) Joseph Jacquard   D) Dr. Hewrman Hollerith
     iii) A collection of 8-bits is called
         A) Byte   B) Word   C) Record   D) File
     iv) A computer resolution is determined by _____
         A) Monitor   B) Video   C) CPU   D) System unit.

   b. With a neat diagram, explain the basic structure of a computer.   **(08 Marks)**

   c. i) Convert the decimal number 512_{10} to binary form
     ii) Convert the binary number 100011 to decimal form.   **(04 Marks)**

   d Explain two type of monitors based on the technique used to display image and text.
                                                 (04 Marks)

2 a. Choose the correct answers for the following :   **(04 Marks)**
     i) The CPU uses a _____ to store and retrieve each piece of data in the memory
         A) Control unit   B) Cache   C) Post   D) Memory location
     ii) A magnetic Disk's tracks are divided into smaller parts called
         A) Clusters   B) Sectors   C) Bytes   D) Slices
     iii) A distributed network configuration in which all data information passes through center computer is
         A) BUS Network   B) Star Network
         C) Ring Network   D) Point-to-Network
     iv) If you want to execute more than one program at a time, the system software you must be capable of
         A) Word processing   B) Virtual Memory
         C) Compiling   D) Multi tasking.

   b. What is an operating system? List and explain different types of operating system based on usage and requirement.   **(08 Marks)**

   c. What is OSI model? Explain principle used to develop seven layers of OSI model.
                                                 (04 Marks)

   d. Briefly explain the following processors :
     i) AMD   ii) IBM.   **(04 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**
  i) The flowcharting symbol diamond shaped box indicates
       A) Start   B) Process Step   C) Decision   D) End
  ii) Which of the following are not valid identifiers
       A) Student-Name   B) Total   C) Znames   D) int
  iii) DOS stands for
       A) Distributed operating systems   B) Disk operating systems
       C) Driver operating systems   D) Diskless operating systems
  iv) Which of the following is an I/P function?
       A) Scanf   B) printf   C) puts( )   D) putchar( ).

  b. Briefly explain the different functions performed by the operating systems. **(04 Marks)**
  c. What is the need of network topology? Explain the following different networking topologies :
     i) Bus Topology ii) Star Topology iii) Ring Topology iv) Mesh Topology. **(08 Marks)**
  d. What is variable? Explain variable initialization. **(04 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**
  i) The step by step procedure to solve a particular problem is called
       A) Flowchart   B) Program   C) Instruction   D) Algorithms
  ii) Which of the following is not a valid assignment expression?
       A) X = 23   B) 4X = 8 = 3   C) Y% = 5   D) x = r = 5
  iii) An infinite loop in a program sequences, causes no output but creates crror, what type error is it?
       A) Syntax Error   B) Logical Error   C) Run-Time Error D) None of these
  iv) Which of the following has highest precedence?
       A) Pre fix increment B) Multiply   C) Modulus   D) Assignment.

  b. Explain the following operators, with example :
     i) Relational operator ii) Increment operator iii) Conditional operator iv) Special operators.
     (08 Marks)
  c. Write a flowchart to generate prime numbers between the limit N_1 and N_2. **(06 Marks)**
  d. What is the value of x? If a = 100, b = 150 and x = (a > b)? a : b;. **(02 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**
  i) To read a single character, which of the following equation is used
       A) putchar( )   B) getchar( )   C) getch( )   D) putch( )
  ii) A function that calls itself for its processing is known as
       A) Inline Function   B) Nested Function
       C) Over loaded Function   D) Recursive Function
  iii) Arguments of a function are separated with
       A) comma (,)   B) semicolon(;)   C) colon(:)   D) None of these
  iv) Which operator has the highest procedures
       A) +   B) *   C) ++   D) >>

  b. What is difference between IF-ELSE and Switch statement? **(04 Marks)**
  c. Explain with an example the different ways of passing parameter to function. **(08 Marks)**
  d. Write a C program to find the largest of their integers with appropriate message. **(04 Marks)**

USN ⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜ **10ELE15/25**

First/Second Semester B.E. Degree Examination, June/July 2017
Basic Electrical Engineering

Time: 3 hrs. Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
atleast TWO questions from each Part.

PART – A

1 a. Choose the correct answers for the following : **(04 Marks)**
   i) As per ohms law
      A) $V \alpha I$ B) $V \alpha R$ C) $I \alpha R$ D) $V = IR$
   ii) Which of the following is true both for a series and parallel circuit
      A) Resistances are additive   B) Currents are additives
      C) Voltage drops are additive   D) Powers are additives
   iii) Inductance opposes _____ in current in a circuit
      A) Only increases   B) Only decreases
      C) Change   D) None of these
   iv) A wire of resistance R is stretched to doubled its length the new resistance of the wire is
      A) R/2   B) 2R   C) 4R   D) R/4.
   b. State and explain Kirchhoff's laws. **(06 Marks)**
   c. Define co-efficient of coupling and obtain the relation between self inductances, mutual inductance and co-efficient of coupling. **(04 Marks)**
   d. Two identical coils of 1200 turns each, are placed side by side such that, 60% of flux produced by one coil links the other. A current of 10A in the first coil, sets up a flux of 0.12 mwb. If the current in the first coil changes from +10A to – 10A in 20m sec.
      Find : i) The self inductance of coils
             ii) The EMF's induced in both coils. **(06 Marks)**

2 a. Choose the correct answers for the following : **(04 Marks)**
   i) An AC voltage is given by 100 sin 314 t. The frequency is
      A) 50 Hz   B) 75 Hz   C) 25 Hz   D) 100 Hz
   ii) An alternating current is given by i = 20 sin 314 t and the time taken to complete 10 cycles is _____
      A) 0.02S   B) 0.2S   C) 2S   D) 0.1S
   iii) The phase difference between V and I for the series R–L circuit _____ as X_L increases
      A) Decreases   B) Remains constant
      C) Increases   D) None of these
   iv) The voltage and current in AC circuit are given by V = 50 cos ωt and i = 5 sin ωt. The power consumed by the circuits.
      A) 0 Watts   B) 250 Watts   C) 100 Watts   D) 50 Watts.
   b. Define average and RMS value of all alternating current and find their relation with maximum value, if the alternating quality is sinusoidal. **(08 Marks)**
   c. A circuit consists of a resistance of 10Ω, an inductance of 16mH and a capacitance of 150µF connected in series. A supply of 100V at 50Hz is given to the circuit. Find the current, power factor and power consumed by the circuit. Draw the vector diagram. **(08 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**

i) In a 3-phase system, the emf's are _____
   A) 30° apart   B) 60° apart   C) 90° apart   D) 120° apart

ii) When the two watt meters used to measure a 3-phase power, give equal readings then the power factor of the circuit is
   A) 0.5   B) 0   C) 0.866   D) 1

iii) Active power drawn by a 3-phase balanced load is given by
   A) $P = V_L I_L \cos \phi$ B) $P = \sqrt{3}\, V_L I_L$
   C) $P = \sqrt{3}\, V_L I_L \cos \phi$ D) $P = \sqrt{3}\, V_{Ph} I_{ph} \cos \phi$

iv) The resistance between any two terminals of a balanced delta connected load is 20Ω. A resistance of each phase is _____
   A) 20Ω   B) 30Ω   C) 10Ω   D) 60Ω

b. With the aid of a phasor diagram obtain the relationship between the line and phase values of voltages in a three-phase, star connected. **(06 Marks)**

c. Show that two Watt meters are sufficient to measure 3ϕ power for balanced 3ϕ power system. **(06 Marks)**

d. Three coils each having a resistance of 10Ω and an inductance of 0.02H are connected in star across 440V, 50Hz, 3-phase supply. Calculate the line current and total power consumed. **(04 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

i) The dyanometer type Watt meters is used to measure _____
   A) Only DC power   B) Only AC power
   C) Both DC and AC power   D) None of these

ii) The unit of electrical is equivalent
   A) 3600 w – s   B) 3.6 kw-s   C) 1 KWH   D) 100 WH

iii) The rotating disc of the energy meter is made of _____
   A) Copper   B) Aluminium   C) Platinum   D) Silver

iv) In an induction type energy meter, the breaking torque is directly proportional to _____
   A) Deflecting torque   B) Controlling torque   C) Speed of the disc   D) Damping torque.

b. With the help of a neat diagram, describe the constructional features and working of a dynamometer type Watt meter. **(06 Marks)**

c. Name different types of domestic wiring and explain any one type of wiring. **(04 Marks)**

d. What is the necessity of earthing? With a neat diagram, explain the pipe earthing. **(06 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**

i) In a wave – winding, the number of parallel paths is equal to _____
   A) P/2   B) 2   C) P   D) 2P

ii) A 4-pole wave connected generator has a useful flux of 0.02. Weber and generates a voltage of 288 V at 1200 rpm the number of conductors in the armature are
   A) 180   B) 360   C) 720   D) 90

iii) High voltage Dc generators uses _____ winding
   A) Lap   B) Wave   C) Either A or B   D) None of these

iv) A commutator is made up of _____
   A) Iron   B) Copper segments   C) Both A and B   D) None of these.

b. Derive an expression for armature torque in a DC motor. **(05 Marks)**

c. The field current in a DC shunt machine is 2A and the line current is 20A at 200V. Calculate: i) The generated EMF. When working as generator ii) Torque in N-m when running at 1500 rpm as motor. Take the armature resistance as 0.5Ω. **(06 Marks)**

d. What is back emf in a Dc motor? What is its significance? **(05 Marks)**

6 a. Choose the correct answers for the following : **(04 Marks)**
   i) When the supply frequency of a transformer is doubled then the hysteresis loses
     A) Remains same   B) Doubled
     C) Reduced by 50%   D) Hysteresis is equal to Eddy current loss
   ii) The losses which donot occur in transformer are _____
     A) copper losses   B) magnetic losses   C) Friction losses   D) none of these
   iii) A transformer transfers electrical energy from primary to secondary usually with a change in
     A) Frequency   B) Power   C) Voltage   D) Time period
   iv) The core of the transformer is laminated to reduce
     A) Eddy current loss B) Hysteresis loss   C) Copper loss   D) Friction loss.
  b. Derive an Emf equation of transformer. **(05 Marks)**
  c. A 600 KVA transformer has a efficiency of 92% at full load, unity power factor and at half load, 0.9 power factor. Determine its efficiency at 75% of full load and 0.9 power factor. **(06 Marks)**
  d. What are the various types of losses and how to overcome these losses in a transformer? **(05 Marks)**

7 a. Choose the correct answers for the following : **(04 Marks)**
   i) The disadvantages of a short pitched coils in an alternator is that
     A) Harmonics are introduced   B) Waveform become non–sinusoidal
     C) Voltage round the coil is reduced   D) None of the above
   ii) An 8-pole alternator runs at 600 rpm. The frequency of the induced Emf is _____
     A) 40Hz   B) 50Hz   C) 60Hz   D) 75Hz
   iii) In an alternator, the number of slots per pole per phase is 4 and the slot angle is 15°. The distribution factor is _____
     A) 0.945   B) 0.966   C) 0.956   D) 0.987
   iv) An alternator generates a no load line voltage of 11 KV. The full load terminal voltage is 10.6KV. The voltage regulation is.
     A) 5%   B) 6%   C) 4%   D) 3.77%.
  b. Derive an expression for Emf equation of an alternator. What is the necessity of considering pitch factor and distribution factor for Emf equation? **(08 Marks)**
  c. A 12 pole, 500rpm, star connected alternator has 60 slots, with 20 concoctors per slot. The flux per pole is 0.02 wb and is distributed sinusoidally. The winding factor is 0.97. Calculate: i) frequency ii) phase Emf iii) Line Emf. **(08 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**
   i) When the rotor of 3φ induction motor is blocked, the slipis _____
     A) 0   B) 0.5   C) 0.1   D) 1
   ii) The direction of rotation of 3φ induction motor depends on _____
     A) supply voltage   B) Number of poles
     C) The supply frequency   D) The phase sequence of the supply
   iii) A 4 pole, 50Hz induction motor has a slip of 4%. The frequency of the rotor current is _
     A) 2.5Hz   B) 2Hz   C) 3Hz   D) 4Hz
   iv) Three phase wound rotor induction motors are also called as _____ motors
     A) synchronous   B) Series   C) Commutator   D) Slip ring.
  b. Mention the advantages and disadvantages of squirrel cage and slip ring induction motors. **(03 Marks)**
  c. Explain why a starter is required for a 3-φ induction motor. With a circuit diagram explain the working of a star-delta starter for a 3-φ induction motor. **(08 Marks)**
  d. A 3-φ induction motor has 6 poles and runs at 940 rpm on full load. It is supplied from an alternator having 4 poles and running at 1500 rpm, Calculate the full load slip and the frequency of the rotor currents of the induction motor. **(05 Marks)**

* * * 3 of 3* * *

First/Second Semester B.E. Degree Examination, June/July 2017
Basic Electronics

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, choosing at least two from each part.*

PART – A

1. a. Choose the correct answers for the following :
   i) The cut in voltage of a silicon diode is about _____
       A) 0.6V   B) 0.6mV   C) 1.2V   D) 1.2mV
   ii) The ripple factor for a full wave rectifier is
       A) 0.482   B) 0.5   C) 1.21   D) −1.21
   iii) PIV rating of a diode in a bridge rectifier is _____

       A) V_m B) $2V_m$ C) $\dfrac{V_m}{2}$ D) $\dfrac{V_m}{\sqrt{2}}$

   iv) The zener resistance of a zener diode, which exhibits 50mV change in V_z for a 2.5mA change in I_z is ____
       A) 10Ω B) 40Ω C) 20Ω D) 60Ω **(04 Marks)**
   b. Draw and explain the V-I characteristics of silicon diode   **(04 Marks)**
   c. Deduce the following for Fullwave rectifier   i) I_{dc} ii) I_{rms} iii) Ripple factor
       iv) Effeciency of rectification.   **(08 Marks)**
   d. A full wave rectifier (bridge) supplies a load of 400Ω in parallel with a capacitor of $500\mu F$. If the ac-supply voltage is 230 sin 314t, V find the i) Ripple factor   ii) Dc load current.
                                                                 (04 Marks)

2. a. Choose the correct answers for the following :
   i) The transistor acts as an amplifier in the _____ region.
       A) cut off   B) active   C) saturation   D) inverse.
   ii) In a transistor the current conduction is due to _____ carriers.
       A) Majority   B) Minority   C) Both   D) None of these.
   iii) The input resistance is highest for _____
       A) CB amplifier   B) CC amplifier   C) CE amplifier   D) None of these.
   iv) The position of Q-point on the dc load line should be _____
       A) stable   B) unstable   C) bistable   D) all the above.
                                                                  (04 Marks)
   b. Draw input and output characteristics of a transistors in common emitter configuration and explain in detail.   **(04 Marks)**
   c. Obtain the relationship between α_{dc} and β_{dc}.   **(08 Marks)**
   d. Calculate the values of I_c, I_E and β_{dc} for a transistor with $\alpha_{dc} = 0.98$ and $I_B = 120\mu A$.
                                                                  (04 Marks)

3. a. Choose the correct answers for the following :
   i) The reverse saturation current doubles for every _____ °C rise in temperature.
       A) 40   B) 45   C) 10   D) 50.
   ii) The stability factor "S" as the rate of change of collector current with _____
       A) Base current   B) Reverse saturation current
       C) Emitter current   D) V_{cc}.
   iii) For an emitter follower, the voltage gain is _____
       A) unity   B) greater than unity   C) less than unity   D) zero.

iv) In the fixed bias circuit, the stabilization of the Q-point is _____.
    A) very poor   B) very high   C) better   D) very good.
                                                                         (04 Marks)

b. Explain the circuit operation and analysis of voltage divider bias. **(08 Marks)**

c. In the circuit shown in Fig. Q3(c), a NPN transistor with $\beta = 100$ is used. Find I_B, I_C and V_{CE}. Draw the dc load line and indicate the Q-point. Take $V_{BE} = 0.7$ volts. **(08 Marks)**
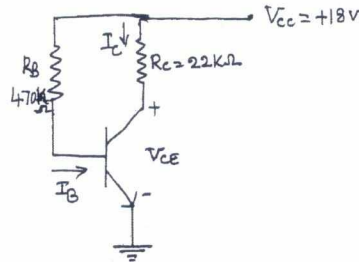

Fig. Q3(c)

4 a. Choose the correct answers for the following :
  i) An SCR has _____ number of p-n junctions
    A) One   B) Two   C) Three   D) Four
  ii) FET is a _____ controlled device.
    A) Voltage   B) Current   C) Power   D) None of these.
  iii) The holding current is an SCR is _____ the latching current.
    A) More than   B) Less than   C) Equal to   D) none of these
  iv) A relaxation uses
    A) MOSFET   B) SCR   C) UJT   D) BJT. **(04 Marks)**

b. Draw and explain the V-I characteristic of SCR. **(08 Marks)**

c. Explain the basic construction and equivalent circuit of UJT. **(08 Marks)**

PART – B

5 a. Choose the correct answers for the following :
  i) Bandwidth of an amplifer is given by _____
    A) $BW = f_L - f_H$ B) $BW = f_H - f_L$ C) $BW = f_L + f_H$ D) $BW = 2f_L - f_H$
  ii) An amplifier is RC phase shift oscillator contributes _____ phase shift.
    A) 180°   B) 0°   C) 90°   D) 60°.
  iii) The crystal oscillator finds use, when the _____ stability is required.
    A) Amplitude   B) Frequency   C) Phase   D) None of these.
  iv) In an oscillator, we use _____ feedback.
    A) Positive   B) Negative   C) Unity grain   D) None of these. **(04 Marks)**

b. Draw a neat circuit diagram of Hartley's oscillator and explain its working. What is the frequency of oscillations? **(08 Marks)**

c. With a neat circuit diagram and frequency response, explain the operation of single stage RC coupled amplifier. **(08 Marks)**

6 a. Choose the correct answers for the following :
  i) An audio amplifier works over the frequency range _____.
    A) 20Hz to 20KHz B) 20Hz to 1MHz C) 1KHz to 4KHz D) None of these.
  ii) Op-amp is basically a _____ amplifier.
    A) Power   B) Differential   C) Optical   D) Current.
  iii) In inverting amplifier there is _____ phase shift between input and output.
    A) 0°   B) 90°   C) 180°   D) 360°
  iv) The maximum rate at which amplifier output can change in volts per microseconds (V/µs) is called _____.
    A) over rate   B) slew rate   C) under rate   D) None of these. **(04 Marks)**

b. List the characteristics of an ideal op.amp.   (06 Marks)
c. Show with a circuit diagram, how the op-amp can be used as an integrator.   (05 Marks)
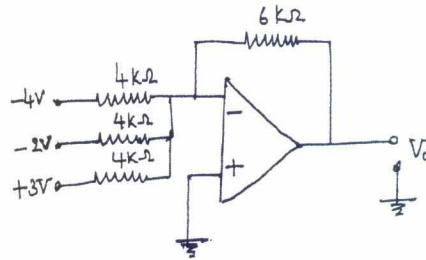d. Find the O/pP voltage of the 3 i/p adder circuit shown below Fig. Q6(d).   (05 Marks)

Fig. Q6(d)

7 a. Choose the correct answers for the following :
   i)   The radio communication uses _____ as communication medium.
        A) Optical fibre   B) Free space   C) conducting wire   D) None of these.
   ii) The circuit that recovers the original modulating information from an AM signal is known as
        A) Modulator   B) Mixer   C) Demodulator   D) Oscillator.
   iii) 2's complement of binary number 10110 as
        A) 00011   B) 01010   C) 11100   D) 11111.
   iv) $(28)_{10} = (\quad)_2$
        A) 11100   B) 01110   C) 11000   D) 00011.
                                                                          (04 Marks)
   b. Explain the need for modulation.   (04 Marks)
   c. Draw the block diagram of a super heterodyne receiver and explain the function of each block.   (06 Marks)
   d. Perform the following :
        i)   Convert $(725.25)_8 = (\quad)_{10} = (\quad)_2$
        ii) Subtract using 2's complement $(4 - 9)_{10}$
        iii) $(11010.101)_2 = (\quad)_8 = (\quad)_{16}$.   (06 Marks)

8 a. Choose the correct answers for the following :
   i)   Universal gates are _____ and _____.
        A) NOT and NOR   B) AND or OR   C) NAND and NOR   D) EX-OR and EX-NOR.
   ii) $(A+B)(B+C) = $ _____
        A) $B + \overline{A}C$ B) $B + \overline{B}C$ C) $B + AC$ D) AB.
   iii) The output is high, when all the inputs are low, such a gate is called _____.
        A) NAND   B) AND   C) OR   D) EX-OR
   iv) Full adder has _____ inputs.
        A) 1   B) 2   C) 3   D) 4.   (04 Marks)
   b. State and prove De Morgan's theorem.   (04 Marks)
   c. Simplify
        i) $\overline{A}\,\overline{B}\,\overline{C} + \overline{A}B\overline{C} + AB\overline{C} + A\overline{B}\,\overline{C}$, realize using basic gates.
        ii) $(A + \overline{B} + C)(\overline{A} + B + C)$, realize using two input NAND gates.   (08 Marks)
   d. Realize a full adder using 2 Half adder and OR gate.   (04 Marks)

* * * * *

3 of 3

USN ☐☐☐☐☐☐☐☐☐☐

First/Second Semester B.E Degree Examination, June/July 2017
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. The president of the constituent assembly was
   a) Dr. K.M. Munshi   b) Jawaharlal Nehru
   c) Dr. B.R. Ambedkar   d) De. Rajendra Prasad

2. The Indian Constitution borrowed the scheme of Indian Federation from the constitution of
   a) U.K   b) Canada   c) Ireland   d) U.S.A

3. How many schedules are there in the Indian Constitution?
   a) 11   b) 12   c) 13   d) 15

4. Who gave the constitution to us?
   a) People of India   b) The British Queen
   c) The Governor General of India   d) None of these

5. The concept of Welfare state is found in the Indian Constitution in the
   a) Fundamental duties   b) Preamble
   c) Directive principles   d) Fundamental rights

6. Rights to freedom guarantees
   a) 5 rights   b) 6 rights   c) 7 rights   d) 8 rights

7. For the enforcement of fundamental rights, the supreme court may issue
   a) A writ   b) A decree   c) An ordinance   d) A notification

8. Which one of the following is not a fundamental duty?
   a) Abide by the constitution and respect its ideals
   b) Vote in public elections
   c) Develop the scientific temper
   d) Safeguard public property and abjure violence

9. Which one has become a legal right under 44th Constitution Amendment Act, 1978?
   a) Right to property
   b) Right to education
   c) Right to work
   d) Right to judicial remedies

10. When fundamental rights of a person are violated, he can appeal to the
    a) President
    b) Prime Minister
    c) Chief Minister of the state
    d) None of them

11. The Panchayat Raj Institutions in India are established as per the constitutional directions of the
    a) federalism
    b) directive principles of state policy
    c) preamble
    d) fundamental rights

12. Which of the following exercised the most profound influence in framing the Indian Constitution?
    a) British Constitution
    b) U.S. Constitution
    c) Irish Constitution
    d) The Government of India Act, 1935.

13. Constitution of India was enacted by the Constituent Assembly on
    a) 26th January 1950
    b) 26th November 1949
    c) 26th September 1948
    d) 20th December 1949

14. Indian Independence Act was passed by the British Parliament on:
    a) 18th July 1947   b) 20th July 1947   c) 14th August 1947   d) 20th July 1946

15. Joint Parliamentary sessions are chaired by
    a) Prime Minister
    b) President
    c) Speaker and Lok Sabha
    d) Chairman of Rajya Sabha

16. Attorney General of India is appointed by the
    a) Parliament
    b) President
    c) Union Law Minister
    d) Chief Justice of India

17. Which of the following bills must be passed by each house of the Parliament separately by special 2/3rd majority?
    a) Finance bill
    b) Ordinary bill
    c) Money bill
    d) Constitution Amendment bill

18. Supreme court of India has interpreted constitutional right to education as
    a) Right to life
    b) Right to equality
    c) Right to employment
    d) Fundamental right

19. Who is the supreme commander of armed forces in India?
    a) Home Minister   b) Defense Minister   c) President   d) Prime Minister

20. Two persons are nominated by the President to be the members of Lok Sabha to represent the
    a) Parsees   b) Anglo-Indians   c) Buddhists   d) Indian-Christians

21. All the Union Council of Ministers are appointed by the
    a) President   b) Prime Minister   c) Lok Sabha speaker   d) vice-President

22. The executive head of the State Government is
    a) Chief Justice of the High Court
    b) The Chief Minister
    c) The Governor
    d) The Prime Minister

23. In the Union Government the Council of Ministers is collectively responsible to the
    a) President   b) Prime Minister   c) Lok Sabha   d) Parliament

24. Who has the authority to approve President's Rule in the state?
    a) Parliament   b) Lok Sabha   c) Prime Minister   d) State Legislature

25. Who is the leader of Lok Sabha?
    a) President   b) Vice President
    c) Speaker of Lok Sabha   d) Prime Minister

26. Rajya Sabha shall consist of not more than
    a) 150 members   b) 200 members   c) 250 members   d) 275 members

27. In India, political parties are given recognition by the
    a) President   b) Law Commission
    c) Election Commission   d) Parliament

28. After declaration of financial emergency by the President, what is the period of operation without approval by the parliament?
    a) three months   b) four months   c) two months   d) one month

29. The judiciary in India is
    a) under the prime minister   b) under the president
    c) under the parliament   d) independent

30. Who among the following appoints Judges of the Supreme Court and High Courts?
    a) Prime Minister   b) Union Law Minister   c) President   d) Parliament

31. Which constitutional organ has the power to amend the constitution of India?
    a) Judiciary   b) Executive   c) Legislative   d) Parliament

32. Which fundamental rights article is enforceable even during the period of National Emergency?
    a) Art.19   b) Art.20   c) Art.21   d) b and c

33. Who appoints the Chief Election Commissioner?
    a) President   b) Prime Minister
    c) Chief Justice of India   d) Speaker of Lok Sabha

34. The fundamental duties of Indian citizens were incorporated in the constitution in the year.
    a) 1976   b) 1978   c) 1952   d) 1954

35. Which among the following directive principles of state policy that has not been implemented so far?
    a) Separation of judiciary from the executive
    b) Organization of village Panchayats
    c) Uniform civil code
    d) Maternity relief to working women.

36. The total members in the state legislative council should not be less than
    a) 100   b) 80   c) 40   d) 30

37. The directive principles of state policy are
    a) political rights   b) social rights
    c) legal rights   d) constitutional rights

38. Governor will not act without the aid and advise of the council of ministers while
   a) Dismissing a Chief Minister
   b) Appointing a cabinet minister
   c) Dissolving the legislative assembly
   d) Recommending president's rule

39. Reservations in promotion in Government jobs may be made in favour of
   a) Muslims
   b) Socially and educationally backward class people
   c) Widows
   d) Scheduled castes

40. Seats for scheduled castes and scheduled tribes are not reserved in
   a) Rajya Sabha
   b) Lok Sabha
   c) State legislative assembly
   d) All of these

41. The obligations and prerogatives associated with a specific role is referred to as
   a) ethics
   b) responsibility
   c) duty
   d) role morality

42. Engineering profession is considered to be like a building, its foundation is
   a) hard and sincere work
   b) honesty
   c) expert engineering knowledge and skill
   d) sound common sense and expert knowledge

43. As applied to responsibility, avoiding blame or being safe is the prime concern in
   a) minimalist model
   b) reasonable care model
   c) good works model
   d) a and b

44. This is not the symptom of group thinking.
   a) mind guarding
   b) self-censorship
   c) microscopic vision
   d) illusion of unanimity

45. Egocentric tendencies means
   a) superiority complex
   b) interpreting situation from limited view
   c) arrogant and irresponsible behaviour
   d) habit of criticizing the views of others

46. Revealing confidential information amounts to
   a) breach of contract
   b) criminal breach of trust
   c) violation of patent right
   d) misusing the truth

47. Conflict of interest exists for an engineer when he is subject to
   a) professional impediments
   b) threat
   c) loyalties
   d) professional harassments

48. The patent holder does not allow others to use patented information for _____ years from the date of filing.
   a) 25
   b) 20
   c) 15
   d) 50

49. The formulae of "PEPSI COLA" is an example of
   a) trade secret
   b) patent
   c) copy right
   d) trade marks

50. An expert testimony does not demand
   a) adequate time for a thorough investigation
   b) consulting extensively with the lawyer
   c) expert legal knowledge
   d) objective and unbiased demeanor.

* * * * *

USN ☐☐☐☐☐☐☐☐☐☐

First/Second Semester B.E Degree Examination, June /July 2017
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 Earth is surrounded by a blanket of air which is reffered to as
   a) Atmosphere   b) Biosphere   c) Hydrosphere   d) Lithosphere

2. The term Biosphere was coined by scientist from
   a) Romania   b) Russia   c) Spain   d) Sweden

3. The mantle supporting lithosphere is known as
   a) Asthenosphere b) Mantle   c) Magma   d) Lava

4. The by – product in Autotrophs is
   a) Carbon   b) Oxygen   c) Nitrogen   d) Hydrogen

5. Fungi and Bacteria are
   a) Producers   b) Hyterotrophs c) Consumers   d) Decomposers

6. Transpiration by plants is affected by
   a) Temperature   b) Pressure   c) Humidity   d) Gravity

7. The process leading to soil depletion in situ is known as
   a) Soil degradation b) Soil erosion c) Urbanization d) None

-A1-

8. Aggregation of clay into sand – sized grains is by
a) Vegetation   b) Wild fire   c) Conservation   d) Overgrazing

9. Removal of trees cause
a) Loss of biodiversity   b) Ecological impact   c) Soil erosion   d) All of these

10. Consumption of fossil fuels result in
a) Ozone depletion   b) Global warming   c) both   d) None of the above

11. Marine Iguanas were killed due to oil spill at
a) Santa Fe   b) Andaman   c) Nicobar   d) Lakshadweep

12. Arsenic , Fluorides , Phosphates emit from
a) Diary plants   b) Distillery unit   c) Fertilizer plant   d) Tanneries

13. Mercaptanes is a gaseous effluent characteristic of
a) Tanneries   b) Chemical industry   c) Petrochemicals   d) All of these

14. As per IS : 10500 – 2003, maximum limit of turbidity is
a) 5 NTU   b) 10 NTU   c) 15 NTU   d) 20 NTU

15. Typhoid is a disease due to presence of
a) Bacteria   b) Fungus   c) Virus   d) All

16. Water borne diseases include
a) Polio   b) Meningitis   c) Cholera   d) All

17. Raw sewage used as fertilizer resulted in cholera at
a) Palestine   b) Peru   c) Paraguay   d) Panama

18. Mathaemoglobinemia is a syndrome due to excess of
a) Nitrates   b) Phosphates   c) Chlorides   d) Sulphates

19. Limestone reefs are built up by
a) Corals   b) Algae   c) Both   d) None of these

20. Coal is a dirty fuel because it emits
a) CO_2 b) SO_2 c) NO_2 d) All

21. Wet gas contains low amounts of
a) Propane   b) Pentane   c) Methane   d) Hexane

22. Chemical added to detect any leakage of LPG is
a) Trihydrothiophe   b) Trinitrothiophene
c) Tritrohythiophene   d) Tritronitrothiophene

23. Huge radioactive fallout on life across Europe is due to nuclear disaster at
a) Cambodia   b) Cameroon   c) Chernobyl   d) Cape Town

24. Nuclear power plant in Karnataka is Situated in
   a) Karwar   b) Kaiga   c) Kudremukh   d) None

25. Tidal energy schemes in India is being experimented in
   a) Mumbai   b) Kerala   c) Tamilnadu   d) Orissa

26. Coal mines result in enhancing hardness of water due to emission of
   a) Sulphuric acid   b) Nitric acid   c) Phosphoric acid   d) All

27. Accelerated Algae and water plant growth is
   a) Putrefaction   b) Eutrophication   c) Denitrification   d) None

28. Silting is encouraged due to photosynthesis of
   a) Algae   b) Bacteria   c) Corals   d) Planktons

29. The word soil is derived from
   a) English   b) French   c) Latin   d) Italian

30. Source of soil pollution is due to
   a) Mining   b) Biological agents   c) Urban wastes   d) All of these

31. Common viruses present in sewage are
   a) Adeno viruses   b) Anterioviruses   c) Glutoviruses   d) All of these

32. Process in which MSW is decomposed is known as
   a) Sanitary landfill   b) Composting   c) Incineration   d) None

33. Progress of a nation depends on
   a) Population density   b) Literacy rates   c) Family size   d) All of these

34. Country not belonging to G7 is
   a) Canada   b) Britain   c) Cambodia   d) Germany

35. Population growth is not the cause of poverty according to
   a) Karl Marx   b) Napoleon   c) Nelson Mandela   d) Lincoln

36. Key remedy for fast population growth happens to be
   a) Prosperity   b) Nutrition   c) Social security   d) All these

37. Major Green House Gas is
   a) CO_2 b) CH_4 c) CFC   d) O_3

38. Kyoto protocol was opened for signature on
   a) February 16, 1998   b) March 16, 1998   c) April 16, 1998   d) May 16, 1998

39. 'Acid Rain' was coined by
   a) Albert Rogers   b) Albert Agnus   c) Robert Angus   d) Alfred Rogers

40. Acid rain can be
   a) Dry   b) Wet   c) Both   d) None of these

41. Lowest P^H recorded in rainwater is
   a) 1.5　　　　　b) 2.5　　　　　c) 3.5　　　　　d) 4.5

42. Primary cause of acid rain is due to presence of
   a) SO_2　　　　b) CO_2　　　　c) NO_2　　　　d) P_2O_5

43. Invaluable stone statues are partially dissolved by acid rain in
   a) Sweden　　　b) Greece　　　c) Ukraine　　　d) Uganda

44. Acid rain has become an invisible threat particularly in
   a) Turkey　　　b) Tuvalu　　　c) Japan　　　d) Jordan

45. U.N. conference on Human Environment held in
   a) Manchester　　b) Glasgow　　c) Stockholm　　d) Liverpool

46. Air Act extends to
   a) North India　　　　　　　b) South Central India
   c) Whole of India　　　　　d) Includes Pakistan

47. Water Act in the first instance applies to
   a) Tamilnadu　　b) Andhra Pradesh　　c) Karnataka　　d) Maharashtra

48. Wild Life Act extends in India except
   a) Karnataka　　b) Kerala　　c) Kashmir　　d) Assam

49. On 29th April 1999, NGO's are signified by UN
   a) President　　b) Secretary General　c) Chief　　d) All

50. Guiding principles for Environmental Education were formulated at conference held in
   a) New York　　b) Tbilisi　　c) Los Angeles　　d) Brimingham

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USN ☐☐☐☐☐☐☐☐☐☐   **10MAT21**

Second Semester B.E. Degree Examination, June/July 2017
Engineering Mathematics – II

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
        2. *Answer all objective type questions on any single page of the answer booklet.*

PART – A

1   a.   Choose the correct answers for the following :   **(04 Marks)**

     i)   Solution of one of the factors of $p^2 - p - 1 = 0$ with $p = \dfrac{dy}{dx}$ is $y = $ _____.

         A) $\left(\dfrac{1+\sqrt{5}}{2}\right)x^4 + C$,   B) $\left(\dfrac{2+\sqrt{5}}{2}\right)x^3 + C$ C) $\left(\dfrac{2-\sqrt{5}}{2}\right)x^2 + C$ D) $\left(\dfrac{1-\sqrt{5}}{2}\right)x + C$

     ii)   On solving for x in $P = \tan\left(x - \dfrac{P}{1+P^2}\right)$ the solution for $y = $ _____.

         A) $C + \dfrac{1}{1+P^2}$ B) $C - \dfrac{2}{1+P^2}$ C) $C - \dfrac{3}{1+P^2}$ D) $C - \dfrac{1}{1+P^2}$

     iii)   The solution for Clairut's form of the differential equation, $(y - Px)(P - 1) = P$ is $y = $ _____.

         A) $Cx - \dfrac{C}{C-1}$ B) $Cx + \dfrac{C}{C-1}$ C) $C^2 - \dfrac{Cx}{C-1}$ D) $C^2 + \dfrac{Cx}{C-1}$

     iv)   If the given equation is solvable for y then it is of the form,

         A) $y = f(x, p)$ B) $x = f(y, p)$ C) $x = f(y/p)$ D) $x = f(p/y)$

   b.   Solve $xyp^2 + p(3x^2 - 2y^2) - 6xy = 0$ with solvable for P.   **(05 Marks)**

   c.   Solve $(px - y)(py + x) = \alpha^2 p$ with $x^2 = u$ and $y^2 = v$ using Clairut's form.   **(05 Marks)**

   d.   Solve $y = x + a\tan^{-1} p$.   **(06 Marks)**

2   a.   Choose the correct answers for the following :   **(04 Marks)**

     i)   Solution of $(D^3 - 2D + 4)y = 0$ is $y = $ _____.

         A) $C_1 e^{2x} + C_2 e^{-x}\cos x + C_3 e^{-x}\sin x$ B) $C_1 e^{2x} + C_2 e^{-x}\cos x$

         C) $C_1 e^{-2x} + C_2 e^x\cos x + C_3 e^x\sin x$ D) $C_1\cos x + C_2\sin x$

     ii)   Particular integral of $(D^2 + 1)y = \sin 2x$ is $y_p = $ _____.

         A) $\dfrac{1}{3}\sin 2x$ B) $\sin 2x$ C) $\cos 2x$ D) $-\dfrac{1}{3}\sin 2x$

     iii)   Particular integral of $(D - 1)y = \sinh x$ is $y = $ _____.

         A) $\dfrac{1}{2}(xe^x + e^{-x})$ B) $\dfrac{1}{2}xe^{-x}$ C) $\dfrac{1}{2}(e^{-x} + e^x)$ D) $\dfrac{1}{2}$

     iv)   The displacement in the simple harmonic motion $\dfrac{d^2 x}{dt^2} = -\mu^2 x$ is _____.

         A) $C_1\cos\mu t - C_2\sin\mu t$ B) $C_1\cos\mu t + C_2\sin\mu t$

         C) $C_1\cos t + C_2\sin t$ D) $C_1\cos t - C_2\sin t$

   b.   Solve $(D^2 - 6D + 13)y = 8e^{3x}\sin 4x + 2^x$.   **(05 Marks)**

   c.   Solve $y'' - 2y' + y = xe^x\sin x$.   **(05 Marks)**

   d.   Solve $(D + 3)x + (D + 1)y = e^t$ and $(D + 1)x + (D - 1)y = t$.   **(06 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**

i) Particular solution of $(D^2 - 1)y = 1$ using variation of parameters is $y_p = $ _____ .

    A) -1 B) -2 C) -3 D) -4

ii) The differential equation, $x^3 y''' + x^2 y'' = \log x$ reduces to the form when $x = e^t$ as,

    A) $(D+1)^3 y = t$ B) $D(D-1)^2 y = t$ C) $D^3 y = 0$ D) $D^2 y = 0$

iii) The complementary function of, $(1+x)^2 y'' + (1+x)y' + y = 2\sin\log(x+1)$ with $(1+x) = e^t$ is $y_c = $ _____ .

    A) $C_1 \cos t - C_2 \sin t$ B) $C_1 \cos 2t + C_2 \sin 2t$

    C) $C_1 \cos t + C_2 \sin t$ D) $C_1 \cos 2t - C_2 \sin 2t$

iv) In $P_0(x)y'' + P_1(x)y' + P_2(x)y = 0$, if $P_0(x) = 0$, then it has

    A) Singular   B) Regular singularity   C) Exact   D) Homogeneous

b. Solve $(D^2 - 3D + 2)y = \dfrac{1}{1+e^{-x}}$ using variation of parameters. **(05 Marks)**

c. Solve $x^2 y'' - x\dfrac{dy}{dx} + y = \log x$. **(05 Marks)**

d. Solve $xy'' + y' + xy = 0$ using Frobenius series solution method. **(06 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

i) The partial differential equation of the relation $z = ax + a^2 y^2 + b$ is $q = $ _____ .

    A) $p^2 y$ B) $2p^2 y$ C) $p^2 y^2$ D) $2py^2$

ii) The solution of $\dfrac{\partial^2 z}{\partial x^2} = z$ is $z = $ _____ .

    A) $C_1(x)e^y + C_2(x)e^{-y}$ B) $C_1(x)e^y - C_2(x)e^{-y}$

    C) $C_1(y)e^x + C_2(y)e^{-x}$ D) $C_1(y)e^x - C_2(y)e^{-x}$

iii) The solution of $yq - xp = z$ by Lagrange's method is _____ $= 0$

    A) $f\left(\dfrac{x}{y}, \dfrac{y}{z}\right)$ B) $f\left(\dfrac{y}{x}, \dfrac{y}{z}\right)$ C) $f\left(xyz, \dfrac{y}{z}\right)$ D) $f\left(xy, \dfrac{y}{z}\right)$.

iv) The solution of $\dfrac{\partial u}{\partial x} = \dfrac{\partial u}{\partial y}$ by separation of variables with K as the common solution is $u = $ _____ .

    A) $Ce^{K(x+y)}$ B) Ce^{Kxy} C) $Ce^{K(x+y)}$ D) Ce^y

b. Form the partial differential equation from the relation $f(x + y + z, x^2 + y^2 + z^2) = 0$. **(05 Marks)**

c. Solve $y^2 p - xyq = x(z - 2y)$ using Lagrange's linear form. **(05 Marks)**

d. Solve $x\dfrac{\partial z}{\partial x} - y\dfrac{\partial z}{\partial y} = 0$ using separation of variables. **(06 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**

i) The value of $\displaystyle\int_0^1 \int_0^6 xy\,dx\,dy$ is _____ .

    A) 6   B) 7   C) 8   D) 9

ii) Area of the ellipse by double integration is = _____ .

    A) $\pi(a+b)$ B) $\pi(a-b)$ C) πab D) $\pi(b-a)$

iii) The value of $\beta\left(\dfrac{1}{2},\dfrac{1}{2}\right) = $ _____ .

    A) $\sqrt{\pi}$ B) π C) $\pi + 1$ D) $\dfrac{\pi}{2}$

iv) The value of $\Gamma\left(\dfrac{1}{4}\right) \times \Gamma\left(\dfrac{3}{4}\right) = $ _____

    A) $\pi\sqrt{2}$ B) $2\sqrt{\pi}$ C) $\sqrt{2\pi}$ D) 2π

b. Change the order of integration in, $I = \displaystyle\int_0^1 \int_{x^2}^{2-x} xy\,dy\,dx$ and hence evaluate.   **(05 Marks)**

c. Evaluate $\displaystyle\int_1^e \int_1^{\log_e y} \int_1^{e} \log z\,dz\,dx\,dy$.   **(05 Marks)**

d. Define Beta and Gamma functions, derive the relation as $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.   **(06 Marks)**

6   a. Choose the correct answers for the following :   **(04 Marks)**

    i) If $\displaystyle\int_C F.d\vec{r} = 0$ then F is called,

        A) Singular   B) Irrotational   C) Solenoidal   D) Domain

    ii) In Green's theorem $\displaystyle\iint_S \left(\dfrac{\partial F_2}{\partial x} - \dfrac{\partial F_1}{\partial x}\right)dx\,dy = $ _____ .

        A) $F_1 + F_2$ B) $\displaystyle\int_C \left(F_1 dx + F_2 dx\right)$ C) $\displaystyle\int_S F_1 dx + F_2 dy$ D) $\displaystyle\int_c \left(F_1 dx + F_1 dy\right)$

    iii) In Stoke's theorem $\displaystyle\int_C F.dR = $ _____ .

        A) $\displaystyle\int_C curlF.Nds$ B) $\displaystyle\int_C divF.Nds$ C) $\displaystyle\int_C gradF.Nds$ D) $\displaystyle\int_S curlF.Nds$

    iv) If $\vec{F} = x^3 i + y^3 j + z^3 k$ then $divF = $ _____

        A) $x^2 + y^2 + z^2$ B) $2(x^2 + y^2 + z^2)$ C) $3(x^2 + y^2 + z^2)$ D) $3(x^2 i + y^2 j + z^2 k)$

b. If $F = (3x^2 + 6y)i - 14yzj + 20xz^2 k$, evaluate $\displaystyle\int_C F.d\vec{r}$ from (0, 0, 0) to (1, 1, 1) along the curve given by $x = t$, $y = t^2$, $z = t^3$.   **(05 Marks)**

c. Use Green's theorem to evaluate $\displaystyle\int_C (y - \sin x)dx + \cos x\,dy$, where C is the triangle in xy-plane bounded by the lines $y = 0$, $x = \dfrac{\pi}{2}$ and $y = \dfrac{2x}{\pi}$.   **(05 Marks)**

d. Use Gauss divergence theorem to evaluate $\displaystyle\int_S F.Nds$ where $F = 4xyi + yzj - xzk$ and S is the surface of the cube bounded by the planes $x = 0$, $x = 2$, $y = 0$, $y = 2$, $z = 0$, $z = 2$.   **(06 Marks)**

7   a. Choose the correct answers for the following :   **(04 Marks)**

    i) $L\{e^{-t}\cosh t\} = $ _____

        A) $\dfrac{s+1}{(s-1)^2 + 1}$ B) $\dfrac{s-1}{(s+1)^2 + 1}$ C) $\dfrac{s+1}{(s-1)^2 - 1}$ D) None of these

ii) $L\{t^{-1}f(t)\} = $ _____

    A) $\int\limits_{S}^{\infty} F(s)ds$ B) $\int\limits_{S}^{\infty} f(t)dt$ C) $\int\limits_{t}^{\infty} F(s)ds$ D) $\int\limits_{0}^{\infty} f(t)dt$

iii)   When T denotes period of the function f(t) then, $\dfrac{1}{1-e^{-ST}}\int\limits_{0}^{T} e^{-st}f(t)dt = $ _____ .

    A) $f(t) + C$ B) $L\{f(t)e^{-st}\}$ C) $L\{f(t)\}$ D) $L\{e^{t}\}$

iv)   In unit step function if $u(t-a) = 0$ then,

    A) $t < a$ B) $t \geq a$ C) $t = a$ D) $t \leq a$

b.   Find the Laplace transform of the function $f(t) = te^{-t}\sin^2 3t$.   **(05 Marks)**

c.   Find the Laplace transform of the function,

$f(t) = \begin{cases} t, & \text{for } 0 < t \leq a \\ 2a - t, & \text{for } a < t < 2a \end{cases}$, 2a is the period.   **(05 Marks)**

d.   Express f(t) in terms of unit step function and find the Laplace transform when,

$f(t) = \begin{cases} t^2, & 0 < t < 2 \\ 4t, & 2 < t < 4 \\ 8, & t > 4 \end{cases}$.   **(06 Marks)**

8 a.   Choose the correct answers for the following :   **(04 Marks)**

i)   The value of $L^{-1}\left\{\dfrac{s^2 - 3s + 4}{s^3}\right\} = $ _____ .

    A) $1 - 3t^2 + 2t$ B) $\dfrac{1+3t}{2t^2}$ C) $1 - 3t + 2t^2$ D) $\dfrac{1+2t^2}{3t}$

ii)   The value of $L^{-1}\left\{\dfrac{s}{(s-2)^2}\right\} = $ _____

    A) $e^{2t}(1 - 2t)$ B) $e^{2t}(1 + 2t)$ C) $e^{2t}(2 + 2t)$ D) $2 + 2t$

iii)   By convolution theorem $L^{-1}\left\{\dfrac{1}{(s+1)(s+2)}\right\} = $ _____ .

    A) $\int_{0}^{\infty} e^{-t}e^{t-2}dt$ B) $\int_{0}^{t} e^{-t}e^{-(t^2-2)}dt$ C) $\int_{0}^{t} e^{-u}e^{-(t-u)(2)}du$ D) $\int_{0}^{\infty} e^{-2t}e^{t^2+1}dt$

iv)   Laplace transform of $\dfrac{dy}{dt} + y = 0$ with $y(0) = 1$ is = _____

    A) e^{-t} B) e^{t} C) te^{t} D) $\dfrac{e^{t}}{t}$

b.   Find the inverse Laplace transform of, $F(s) = \dfrac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}$.   **(05 Marks)**

c.   Find $L^{-1}\left\{\dfrac{s}{(s-1)(s^2+4)}\right\}$ by convolution theorem.   **(05 Marks)**

d.   Solve by Laplace transform method, $\dfrac{d^2 y}{dt^2} - 3\dfrac{dy}{dt} + 2y = 4t + 12e^{-t}$ with $y(0) = 6$, $y'(0) = -1$ **(06 Marks)**

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