First Semester B.E. Degree Examination, December 2011
Engineering Mathematics - I

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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART - A

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

i) If $y = \frac{x}{x-1}$, then y_n is

A) $\frac{(-1)^{n-1}n!}{(x-1)^{n+1}}$ B) $\frac{(-1)^n n!}{(x-1)^{n+1}}$ C) $\frac{(-1)^n(n+1)!}{(x-1)^{n+1}}$ D) $\frac{(-1)^n n!}{(x-1)^n}$

ii) If $y = \log(ax+b)$, then y_n is

A) $\frac{(-1)^n n!a^n}{(ax+b)^n}$ B) $\frac{(-1)^{n-1}n!a^n}{(ax+b)^{n+1}}$ C) $\frac{(-1)^{n-1}(n-1)!a^n}{(ax+b)^n}$ D) $\frac{(-1)^n(n-1)!a^n}{(ax+b)^{n+1}}$

iii) If $f(x) = \sin x$, $x \in (0, \pi)$, then by Rolle's theorem the value of 'x', where the Tangent is parallel to x – axis.

A) 0 B) $\pi/2$ C) $\pi/3$ D) $\pi/4$

iv) Expansion of log (1+x) in powers of x is

A) $x + \frac{x^2}{2} + \frac{x^3}{3} + \ldots$ B) $x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots$

C) $1 - \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \ldots$ D) $\frac{x}{1!} - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \ldots$

a. If $x = \text{Tan}(\log y)$, show that $(1+x^2)y_{n+1} + (2nx-1)y_n + n(n-1)y_{n-1} = 0$. **(04 Marks)**

b. State and prove Cauchy's mean value theorem. **(06 Marks)**

c. Expand $f(x) = \sin(e^x - 1)$ in power's of 'x' upto the terms containing x^4. **(06 Marks)**

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

i) The indeterminate form of $\underset{x\to 1}{\text{Lt}}\left(\frac{x}{x-1} - \frac{(x-1)}{\log x}\right)$ is

A) $\infty - \infty$ B) $\frac{0}{0}$ C) $\frac{\infty}{\infty}$ D) None of these

ii) The angle between the radius vector and the tangent to the curve $r = k\, e^{\theta \text{Cot}\alpha}$, where K and α are constants, is :

A) K B) θ C) α D) O

iii) The Pedal equation of the curve $r = a\theta$ is.

A) $p^2 = ar$ B) $\frac{1}{p^2} = \frac{a}{r^2}$ C) $\frac{1}{p^2} = \frac{1}{r^2} + a^2$ D) $\frac{1}{p^2} = \frac{1}{r^2} + \frac{a^2}{r^4}$

iv) The radius of curvature at any point 't' on the curve defined by $x = f(t)$, $y = \phi(t)$ is given by

A) $\frac{[(x')^2 + (y')^2]^{3/2}}{x'y'' - y'x''}$ B) $\frac{x'y'' - y'x''}{[(x')^2 + (y')^2]^{3/2}}$ C) $\frac{(x')^2 + (y')^2}{(x'y'' - y'x'')^{3/2}}$ D) $\frac{(x'y'' - y'x'')^{3/2}}{(x')^2 + (y')^2}$

b. Find the angle of intersection between the curves $r^n \cos(n\theta) = a^n$ and $r^n \sin(n\theta) = b^n$. **(04 Marks)**

c. Show that the radius of curvature at any point 'θ' to the curve $x = a(\theta + \sin\theta)$, $y = a(1-\cos\theta)$, is $4a\cos(\theta/2)$. **(06 Marks)**

d. Evaluate $\lim_{x\to 0}\left(\frac{a^x + b^x + c^x}{3}\right)^{1/x}$. **(06 Marks)**

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

i) If $u = x^{y-1}$, then $\frac{\partial u}{\partial y}$ is

A) $x^{y-1}\log x$ B) $(y-1)x^{y-2}$ C) $x^{y-1}\log y$ D) $x^y \log x$

ii) If $Z = f(u, v)$, where $u = x + ct$ and $v = x - ct$, then $\frac{\partial z}{\partial t}$ is given by

A) $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v}$ B) $\frac{\partial z}{\partial u} + \frac{\partial z}{\partial v}$ C) $c\left(\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v}\right)$ D) $c\left(\frac{\partial z}{\partial v} - \frac{\partial z}{\partial u}\right)$

iii) If $x = u(1-v)$, $y = uv$, then $J\left(\frac{x,y}{u,v}\right)$ is equal to

A) u B) $\frac{1}{u}$ C) uv D) u/v

iv) The necessary condition for the function f(x, y) to possess extreme values is

A) $f_x = f_y = 0$ B) $f_{xx} - f_{yy} = 0$ C) $(f_{xx})(f_{yy}) - f^2_{xy} = 0$ D) $f_x > 0, f_y > 0$

b. If $u = f\left(\frac{y-x}{xy}, \frac{z-x}{xz}\right)$, find $x^2 \frac{\partial u}{\partial x}$. **(04 Marks)**

c. If $x + y + z = u$, $y + z = v$ and $z = uvw$, show that $J\left(\frac{x,y,z}{u,v,w}\right) = uv$. **(06 Marks)**

d. The Horse power required to propel a steamer is proportional to the square of the distance and cube of the velocity. If the distance is increased by 4% and velocity increased by 3%, find the percentage of increase in the Horse power. **(06 Marks)**

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

i) If $\vec{R} = xi + yj + zk$, $|\vec{R}| = r$, then ∇r^2 is equal to

A) $\frac{\vec{R}}{r^2}$ B) $\frac{-\vec{R}}{2}$ C) $\frac{\vec{R}}{r}$ D) $2\vec{R}$

ii) If $\vec{F} = 3x^2 i - xyj + (a-3)x\,z\,k$ is solenoidal, then 'a' is equal to

A) 0 B) -2 C) 2 D) 3

iii) If $\vec{A} = x^2 i + y^2 j + z^2 k$, then curl $\vec{A}$ is given by

A) $2xi + 2yj + +2zk$ B) 0 C) $\frac{xi + yj + zk}{2}$ D) $2x + 2y + 2z$

iv) The scale factors for cylindrical coordinate system ($\rho\ \phi\ z$) are given by

A) $(\rho, 1, 1)$ B) $(1, \rho, 1)$ C) $(1, 1, \rho)$ D) None of these

b. Prove that $\nabla.\phi\vec{F} = \nabla\phi.\vec{F} + \phi(\nabla.\vec{F})$. **(04 Marks)**

c. If $\vec{F} = 2xy^3z^4 i + 3x^2y^2z^4 j + 4x^2y^3z^3 k$, find i) $(\nabla.\vec{F})$ ii) $\nabla\times\vec{F}$. **(06 Marks)**

d. Obtain the expression for $\nabla.\vec{F}$ in orthogonal curvilinear coordinate system ($u_1\ u_2\ u_3$). **(06 Marks)**

PART – B

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

i) Given $\int_0^1 x^n dx = \frac{1}{x+1}$, then $\frac{d^2}{dx^2}\int_0^1 x^n dx$ gives

A) $\int_0^1 (\log x)^2 x^n dx = \frac{2}{(1+n)^2}$ B) $\int_0^1 (\log x)^2 x^n dx = \frac{2}{(1+n)^3}$

C) $\int_0^1 (\log x)^n x^n dx = \frac{2}{(1+n)^2}$ D) $\int_0^1 (\log x)^2 x^n dx = \frac{-2}{(1+n)^3}$

ii) The value of the integral $\int_0^{\pi} \sin^6 x \cos^5 x \, dx$ is

A) 0 B) $\frac{8}{693}$ C) $\frac{8\pi}{693}$ D) None of these

iii) The volume of the solid generated by revolving the curve r = a (1 + Cosθ) about the line θ = 0 is given by

A) $\frac{2\pi}{3}a^3\int_0^{\pi}(1+\text{Cos}\theta)^3 \text{Sin}\theta \, d\theta$ B) $\frac{2\pi}{3}a^3\int_0^{\pi}(1+\text{Cos}\theta)^3 \text{Cos}\theta \, d\theta$

C) $\frac{2\pi}{3}a^3\int_0^{2\pi}(1+\text{Cos}\theta)^3 \text{Sin}\theta \, d\theta$ D) $\frac{4\pi a^3}{3}$

iv) The entire length of the asteroid $x^{2/3} + y^{2/3} = a^{2/3}$ is

A) 4a B) 8a C) 6a D) 3a

b. Obtain the reduction formula of the integral $\int \text{Cos}^n x \, dx$. **(04 Marks)**

c. Using Leibnitz rule under differentiation under integral sign, evaluate $\int_0^{\pi}\frac{\log(1+2\text{Cos}x)}{\text{Cos}x}dx$. **(06 Marks)**

d. Find the surface generated by revolving the cycloid x = a (θ - Sinθ), y = a (1 - Cosθ) about its base, (consider one arc in the 1st quadrant). **(06 Marks)**

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

i) The general solution of the differential equation $\frac{dy}{dx} = \sec\left(\frac{y}{x}\right) + \frac{y}{x}$ is

A) Tan y/x – logx = c B) Sin (y/x) – logx = c

C) Cosec (y/x) – logx = c D) Cos (y/x) – logx = c

ii) Integrating factor for the differential equation $\frac{dx}{dy} + \frac{2x}{y} = y^2$ is

A) y^2 B) e^{x^2} C) e^{2y} D) e^{y^2}

iii) The general solution of the differential equation (x – y) dx + (y – x) dy = 0 is

A) $\frac{x^2}{2} - y - \frac{y^2}{2} = c$ B) $\frac{x^2}{2} - y + \frac{y^2}{2} = c$ C) $\frac{x^2}{2} - yx + \frac{y^2}{2} = c$ D) None of these

iv) Given the differential equation of f(r, θ, c) = 0, we get differential equation of orthogonal trajectories by changing $r\frac{d\theta}{dr}$ by

A) $\frac{1}{r}\frac{dr}{d\theta}$ B) $-r^2\frac{dr}{d\theta}$ C) $\frac{-1}{r}\frac{dr}{d\theta}$ D) $r\frac{dr}{d\theta}$.

b. Solve $(x^2 - 4xy - 2y^2)\,dx + (y^2 - 4xy - 2x^2)\,dy = 0$. **(04 Marks)**

c. Solve $(x + 2y^3)\frac{dy}{dx} = y$. **(06 Marks)**

d. Find the orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$ ('λ' being the parameter). **(06 Marks)**

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

i) The rank of the matrix $\begin{pmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 16 & 4 & 12 & 15 \end{pmatrix}$ is equal to

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

ii) The exact solution of the system of equations $10x + y + z = 12$, $x + 10y + z = 12$, $x + y + 10z = 12$ by inspection is equal to

A) $[0\ 0\ 0]^T$ B) $[1\ 1\ 1]^T$ C) $[1\ 1\ -1]^T$ D) $[-1\ -1\ -1]^T$

iii) If the given system of linear equations in 'n' variables is consistant then the number of linearly independent solution is given by

A) n B) n - 1 C) r - n D) n – r

(Where 'r' stands for rank of co-efficient, matrix).

iv) The trivial solution for the given system of equations $qx - y + 4z = 0$, $4x - 2y + 3z = 0$, $5x + y - 6z = 0$ is

A) (1, 2, 0) B) (0 4 1) C) (0 0 0) D) (1 -5 0)

b. Using elementary row transformations find the rank of the matrix $\begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{pmatrix}$. **(04 Marks)**

c. Test for consistency and solve the system of equations $x + 4 + 3z = 0$, $x - y + z = 0$, $2x - y + 3z = 0$. **(06 Marks)**

d. Applying Gauss Jordan method solve $2x + 3y - z = 5$, $4x + 4y - 3z = 3$, $2x - 3y + 2z = 2$. **(06 Marks)**

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

i) The linear transformation $y = Ax$ is regular if

A) $|A| = 0$ B) $|A| = 1$ C) $|A| = -1$ D) $|A| \neq 0$

ii) The transformation $\xi = x\ \text{Cos}\alpha - y\ \text{Sin}\alpha$, $\eta = x\ \text{Sin}\alpha + y\ \text{Cos}\alpha$ is orthogonal then the inverse of the transformation matrix is given by

A) $\begin{pmatrix} \text{Cos}\alpha & \text{Sin}\alpha \\ -\text{Sin}\alpha & \text{Cos}\alpha \end{pmatrix}$ B) $\begin{pmatrix} \text{Cos}\alpha & -\text{Sin}\alpha \\ \text{Sin}\alpha & \text{Cos}\alpha \end{pmatrix}$ C) $\begin{pmatrix} \text{Sin}\alpha & \text{Cos}\alpha \\ \text{Cos}\alpha & -\text{Sin}\alpha \end{pmatrix}$ D) $\begin{pmatrix} -\text{Sin}\alpha & \text{Cos}\alpha \\ \text{Cos}\alpha & \text{Sin}\alpha \end{pmatrix}$

iii) The eigen vector 'x' of the matrix 'A' corresponding to eigen value 'λ' satisfy the equation

A) $AX = \lambda X$ B) $\lambda(A - X) = 0$ C) $XA - \lambda A = 0$ D) $|A - \lambda I|X = 0$

iv) Two square matrices A and B are similar if

A) $A = B$ B) $B = P^{-1}AP$ C) $A^1 = B^1$ D) $A^{-1} = B^{-1}$

b. Show that the transformation given below $y_1 = 2x_1 + x_2 + x_3$, $y_2 = x_1 + x_2 + 2x_3$, $y_3 = x_1 - 2x_3$ is regular and find the inverse transformation. **(04 Marks)**

c. Find the matrix P which diagonalizes the matrix $A = \begin{bmatrix} -1 & 1 & 2 \\ 0 & -2 & -1 \\ 0 & 0 & -3 \end{bmatrix}$. **(06 Marks)**

d. Reduce the quadratic form $x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3$ in to canonical form by an appropriate orthogonal transformation which transforms $x_1\ x_2\ x_3$ in terms of new variables $y_1\ y_2\ y_3$. **(06 Marks)**

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10MAT21

Second Semester B.E. Degree Examination, December 2011
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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART – A

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

i) The general solution of the equation $yp^2 + (x-y)p - x = 0$ is

A) $(x-y-c)(x^2+y^2-c)=0$ B) $(y-x-c)(x^2-y^2-c)=0$

C) $(y-x-c)(y^2-x^2-c)=0$ D) $(y-x-c)(x^2+y^2-c)=0$

ii) The given differential equation is solvable for x, if it is possible to express x in terms of,

A) x and y B) x and p C) y and p D) None of these

iii) The singular solution of the equation $y = px + \frac{a}{p}$ is

A) $y^2 = 4ax$ B) $x^2 = 4ay$ C) $x^2 = y$ D) $y^2 = x$

iv) The general solution of Clairaut's equation is,

A) $y = cx + f(c)$ B) $x = cy + f(c)$ C) $y = cx - f(c)$ D) None of these

b. Solve : $p(p+y) = x(x+y)$. **(04 Marks)**

c. Obtain the general solution and the singular solution of the equation, $y = 2px + p^2y$. **(06 Marks)**

d. Obtain the general and singular solution of Clairaut's equation, $xp^3 - yp^2 + 1 = 0$. **(06 Marks)**

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

i) The particular integral of $(D^2 + a^2)y = \sin ax$ is

A) $-\frac{x}{2a}\cos ax$ B) $\frac{x}{2a}\cos ax$ C) $-\frac{ax}{2}\cos ax$ D) $\frac{ax}{2}\cos ax$

ii) The solution of the differential equation $y'' + y = 0$ satisfying the conditions $y(0) = 1$ and $y\left(\frac{\pi}{2}\right) = 2$ is

A) $y = \cos x - 2\sin x$ B) $y = 2\sin x - \cos x$

C) $y = \cos x + 2\sin x$ D) $y = C_1\cos x + C_2\sin x$

iii) P.I of $(D+1)^2 y = xe^{-x}$ is,

A) $\frac{x}{6}e^{-x}$ B) $\frac{x^3}{6}e^{-x}$ C) $-\frac{x^3}{6}e^{-x}$ D) $\frac{x^2}{2}e^{-x}$

iv) P.I of $(D^2 + D)y = x^2 + 2x + 4$ is

A) $\frac{x^2}{3} + 4x$ B) $\frac{x^3}{3} + 4$ C) $\frac{x^3}{3} + 4x$ D) $\frac{x^3}{3} + 4x^2$

b. Solve : $(D-2)^2 y = 8(e^{2x} + \sin 2x)$ **(04 Marks)**

c. Solve : $y'' - 2y' + y = x\cos x$ **(06 Marks)**

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

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

i) The complementary function of the equation $x^2y'' - xy' + y = \log x$ is

A) $y = (C_1 + C_2x)e^x$ B) $y = (C_1 + C_2 \log x)x$

C) $y = (C_1 + C_2x)x$ D) $y = C_1e^x + C_2e^{-x}$

ii) The homogeneous linear differential equation whose auxillary equation has roots 1, -1 is

A) $x^2y_2 - xy_1 + y = 0$ B) $x^2y_2 - xy_1 - y = 0$

C) $y'' - y = 0$ D) $x^2y_2 + xy_1 - y = 0$

iii) To transform $xy'' + y' = \frac{1}{x}$ into a linear differential equation with constant coefficients put x = ...

A) e^t B) e^{-t} C) logt D) None of these

iv) The solution of $x^2y'' + xy' = 0$ is

A) $y = C_1 \cos x + C_2 \sin x$ B) $y = C_1e^x + C_2e^{-x}$

C) $y = a \log x + b$ D) $y = C_1 + 6x^3$

b. Solve $y'' - 6y' + 9y = \frac{e^{3x}}{x^2}$ by the method of variation of parameters. **(04 Marks)**

c. Solve : $(1+x^2)\frac{d^2y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$. **(06 Marks)**

d. Solve by Frobenius method the equation: $4x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$. **(06 Marks)**

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

i) The solution of $\frac{\partial^2 z}{\partial y^2} = \sin(xy)$ is

A) $z = -x^2 \text{ Sin } (xy) + yf(x) + g(x)$ B) $z = -x^2 \text{ Cos } (xy) - yf(x) + g(x)$

C) $z = -\frac{\text{Sin}(xy)}{x^2} + yf(x) + g(x)$ D) None of these

ii) A solution of $(y - z)p + (z - x)q = x - y$ is

A) $x^2 + y^2 + z^2 = f(x - y - z)$ B) $x^2 + y^2 + z^2 = f(x + y + z)$

C) $x^2 - y^2 - z^2 = f(x + y + z)$ D) $x^2 + y^2 - z^2 = f(x + y + z)$

iii) The partial differential equation obtained from z = ax + by + ab is

A) $px + qy + z = 0$ B) $px + qy + z^2 = 0$

C) $px - qy = z$ D) $px + qy = z$

iv) The partial differential equation obtained from $z = e^y f(x + y)$ is

A) $p + z = q$ B) $p - z = q$ C) $p - q = z$ D) None of these

b. Form the partial differential equation by eliminating the arbitrary functions from $z = f(y - 2x) + g(2y - x)$. **(04 Marks)**

c. Solve : $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$. **(06 Marks)**

d. Solve : $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$ by the method of separation of variables, given $u(0, y) = 2e^{5y}$. **(06 Marks)**

PART – B

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

i) $\int_0^2 \int_0^x (x + y)\,dx\,dy = ...$

A) 0 B) 1 C) 3 D) 4

ii) $\int_0^\infty e^{-x^2} dx = ...$

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

iii) The value of $\beta(2, 1) + \beta(1, 2)$ is

A) 0 B) $\frac{1}{2}$ C) 2 D) 1

iv) $\int_0^2 \int_1^3 \int_1^2 xy^2z \; dz\, dy\, dx = ...$

A) 26 B) 25 C) 1 D) 0

b. Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} xy \, dx\, dy$ and hence evaluate the same. **(04 Marks)**

c. Evaluate $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} \, dx\, dy$ by changing to polar coordinates. **(06 Marks)**

d. Show that $\beta(m,n) = \int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx$. **(06 Marks)**

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

i) If $\vec{F} = x^2 i + xyj$ then $\int_C \vec{F}.d\vec{r}$ from (0, 0) to (1, 1) along the line $y = x$ is

A) 0 B) $\frac{2}{3}$ C) $\frac{3}{2}$ D) None of these

ii) The value of $\iint_S (yz\, dy\, dz + zx\, dz\, dx + xy\, dx\, dy)$ where s is the surface of unit sphere $x^2 + y^2 + z^2 = 1$ is

A) 0 B) 4π C) $\frac{4\pi}{3}$ D) 10π

iii) A necessary and sufficient condition that the line integral $\int_L F \,.\, dR$ for every closed curve C is

A) Curl F = 0 B) div F = 0 C) Curl F ≠ 0 D) div F ≠ 0

iv) If V is the volume bounded by a surface S and $\vec{F}$ is a continuously differentiable vector function then $\iiint_V \text{div}\, \vec{F}\, dv = ...$

A) 0 B) $\iint_S \vec{F} \times \hat{n}\, ds$ C) $\iint_S \vec{F} \,.\, \hat{n}\, ds$ D) None of these

b. Using Green's theorem evaluate $\int_C [(xy + y^2)dx + x^2 dy]$ where C is bounded by $y = x$ and $y = x^2$. **(04 Marks)**

c. Verify Stroke's theorem for the vector $\vec{F} = (x^2 + y^2)i - 2xyj$ taken round the rectangle bounded by $x = 0$, $x = a$, $y = 0$, $y = b$. **(06 Marks)**

d. Using divergence theorem evaluate $\int_S \vec{F}.ds$ where $\vec{F} = 4xi - 2y^2j + z^2k$ and S is the surface bounded by the region $x^2 + y^2 = 4$, $z = 0$, $z = 3$. **(06 Marks)**

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

i) If $L\{f(t)\} = f(s)$ then $L\{e^{-at} f(t)\}$ is

A) $f(s-a)$ B) $f(s+a)$ C) $f(s)$ D) None of these

ii) $L\left\{\frac{\text{Sin at}}{t}\right\} = \ldots\ldots$

A) $\text{Cos}^{-1}\left(\frac{s}{a}\right)$ B) $\tan^{-1}\frac{s}{a}$ C) $\frac{\pi}{2} + \tan^{-1}\frac{s}{a}$ D) None of these

iii) $L\{u(t+2)\} = \ldots\ldots$

A) $\frac{e^{-2s}}{s^2}$ B) e^{2s} C) $\frac{e^{2s}}{s}$ D) $\frac{e^{-2s}}{s}$

iv) $L\{s(t)\} = \ldots\ldots$

A) 0 B) e^{-as} C) ∞ D) 1

b. Find the value of $\int_0^\infty t^3 e^{-t} \text{ Sin t dt}$ using Laplace transforms. **(04 Marks)**

c. If $f(t) = \begin{cases} t, & 0 \le t \le a \\ 2a - t, & a \le t \le 2a \end{cases}$, where $f(t+2a) = f(t)$, show that $L\{f(t)\} = \frac{1}{s^2}\tan h\left(\frac{as}{2}\right)$. **(06 Marks)**

d. Express $f(t) = \begin{cases} 1, & 0 < t \le 1 \\ t, & 1 < t \le 2 \\ t^2, & t > 2 \end{cases}$ interms of unit step function and hence find its Laplace transform. **(06 Marks)**

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

i) $L^{-1}\left\{\frac{1}{s^n}\right\}$ is possible only when n is

A) zero B) –ve integer C) +ve integer D) –ve rational

ii) $L^{-1}\left\{\frac{s}{(s-1)^3}\right\} = \ldots\ldots$

A) $e^{-t}(t+t^2)$ B) $e^t\left(t + \frac{t^2}{2!}\right)$ C) $t\,e^t + t^2 e^t$ D) None of these

iii) $L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\} = \ldots\ldots$

A) 2 Sin t B) 2 Cos h t C) Sin h t D) 2 Sin h t

iv) $L^{-1}\left\{\frac{s}{(2s+3)^2}\right\} = \ldots\ldots$

A) $-\frac{1}{8}(2-3t)e^{\frac{-3t}{2}}$ B) $\frac{1}{8}(2-3t)e^{\frac{-3t}{2}}$ C) $2e^{\frac{-3t}{2}} - 3te^{\frac{-3t}{2}}$ D) None of these

b. Find $L^{-1}\left\{\frac{5s+3}{(s-1)(s^2+2s+5)}\right\}$. **(04 Marks)**

c. Using convolution theorem evaluate $L^{-1}\left\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right\}$. **(06 Marks)**

d. Solve $y''' + 2y'' - y' - 2y = 0$ given $y(0) = y'(0) = 0$ and $y''(0) = 6$ by using Laplace transform method. **(06 Marks)**

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10CHE12/22

First/Second Semester B.E. Degree Examination, December 2011
Engineering Chemistry

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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART – A

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

i) The reference electrode used in measurement of standard reduction potential is
A) Standard calomel electrode B) Hydrogen electrode
C) Ag-Agcl electrode D) Standard hydrogen electrode

ii) When the concentration of chloride ions in Ag-Agcl electrode increases, the potential of the electrode
A) Increases B) Decreases
C) Does not change D) None of these

iii) Nernsts equation is based on
A) Thermodynamic principle
B) An equation for redox potential
C) Increase in the free energy of the system
D) None of the above

iv) In a Galvanic cell oxidation takes place at
A) Electrolyte B) Cathode C) Anode D) Salt bridge

b. What are concentration cells? Derive an expression for the EMF of a concentration cell. **(05 Marks)**

c. Define standard electrode potential. Explain the origin of electrode potential. **(06 Marks)**

d. An electro chemical cell is formed from nickel and lead electrodes having 0.01m $NiSO_4$ and 0.5m $PbSO_4$ Electrolytes. The standard electrode potentials of Ni and Pb electrodes are – 0.24V and – 0.13V respectively. Write the cell scheme, cell reaction and calculate EMF of the cell at 298 K. **(05 Marks)**

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

i) Cycle life is applicable only to
A) Primary batteries B) Secondary batteries
C) Reserve batteries D) All the above

ii) The electrolyte used in z_n – air battery is
A) aq H_2SO_4 B) Conc.KC*l*
C) Aq.KOH D) Aq.Hc*l*

iii) EMF of a battery depends on
A) Standard electrode potential B) Temperature
C) Reaction quotient D) All the above

iv) The fuel cells are more superior than the batteries as
A) They are light in weight B) They are eco friendly
C) They produce current at low cost D) All the above

b. Discuss construction and working of load-acid storage battery. **(06 Marks)**

c. Explain construction and working of Ni-MH battery. **(04 Marks)**

d. What are fuel cells? Describe the construction and working of $CH_3OH - O_2$ fuel cell. **(06 Marks)**

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

i) At high hydrogen over voltage, the rate of corrosion
   A) Increases B) Decreases
   C) Increases initially and then decreases D) Remains un changed

ii) Metal iron is coated with zinc metal to prevent corrosion. The process is
   A) Anodic coating B) Cathodic coating
   C) Inorganic coating D) Painting

iii) In corrosion, the gas which is produced in acidic medium is
   A) Hydrogen B) Oxygen
   C) Nitrogen D) Carbon dioxide

iv) The type of corrosion occuring in wire fence is
   A) Galvanic corrosion B) Inter – granular corrosion
   C) Differential aeration corrosion D) Water – line corrosion

b. Discuss :
   i) Stress corrosion
   ii) Water line corrosion. **(06 Marks)**

c. Explain the influence of following factors on the rate of corrosion :
   i) Nature of corrosion product ; ii) Anodic and cathodic area. **(04 Marks)**

d. Describe the following process : i) Galvanising ; ii) Tinning. **(06 Marks)**

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

i) In electroplating, the article to be plated is subjected to pickling. This is to
   A) Remove grease B) Increase rate of plating
   C) Remove oxide scale D) Get a bright deposit

ii) The decomposition potential is equal to
   A) Back EMF B) Cell voltage
   C) Current density D) None of the above

iii) Brightners are added to plating bath in order to
   A) To get uniform deposit
   B) Make grain size of the deposit smaller than λ of light
   C) To get thick deposit
   D) Remove colour

iv) Which of the following is essential in electroless plating
   A) Oxidising agent B) Reducing agent
   C) Anode D) Electrical energy

b. What is meant by metal finishing? Explain the process of electroplating of gold. **(06 Marks)**

c. Discuss the influence of the following in electroplating bath solution. **(04 Marks)**

d. What is electroless plating? Explain electroless plating of nickel, with relavent reactions. **(06 Marks)**

PART – B

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

i) The process of breaking down hydrocarbons of higher molecular weight into lighter hydrocarbons is known as

A) Refining B) Reforming
C) Isomerization D) Cracking

ii) The octane number of a fuel is a measure of

A) Its ability to resist anti knocking
B) Inability to offer resistance for knocking
C) Its ability to resist knocking
D) None of the above.

iii) The addition of TEL to gasoline is

A) Decreases the octane number
B) Increases the octane number
C) Decreases the cetane number
D) Increases the cetane number

iv) Photovoltaic cell consists of

A) p – n junction B) n – type junction
C) p – type junction D) None of the above

b. What is reforming of petroleum? Give any four reactions involved in reforming. **(06 Marks)**

c. Discuss the following : i) Power alcohol ; ii) Biodiesl. **(06 Marks)**

d. On burning 0.85×10^{-3} kg of a solid fuel in a bomb calorimeter, the temperature of 2.1 kg water is raised from 24°C to 27.6°C. The water equivalent of calorimeter and latent heat of steam are 1.1 kg and 2454 kJ/kg respectively. Specific heat of water is 4.187 kJ/kg. If the fuel contains 2% hydrogen, calculate its gross and net calorific values. **(04 Marks)**

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

i) Flame photometer is based on

A) Atomic absorption B) Molecular absorption
C) Atomic emission D) All the above

ii) Condensed phase rule for a two component system is

A) P + F = C + 3 B) P + F = C – 2
C) P + C = F + 1 D) P + F = C + 1

iii) At eutectic point the composition of lead and silver has

A) Lowest melting point B) Highest melting point
C) Lowest boiling point D) Highest boiling point

iv) The filter used in copper colorimetry is

A) 420 nm B) 520 nm
C) 620 nm D) 320 nm

b. State phase rule. Give phase diagram of water system and explain application of phase rule to water system. **(06 Marks)**

c. Explain the application of phase-rule to lead silver system. **(06 Marks)**

d. Give the components of the instruments required for potentiometry. Explain an application of potentiometry. **(04 Marks)**

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

i) Kevlar is a

A) Polyurethane B) Polycarbonate C) Polystyrene D) Polyamide

ii) Which one is a conducting polymer?

A) Aniline B) Pyrrole C) Poly acetylene D) Acetylene

iii) Very high molecular weight polymers will have

A) Low Tg B) High Tg C) Moderate Tg D) No Tg

iv) The polymer widely used in making inner tubes of tyre is

A) Neoprene rubber B) Butyl rubber

C) Styru – butadiene rubber D) Natural rubber

b. What are polymers? Discuss the free radical mechanism of polymerization of ethylene. **(05 Marks)**

c. Give the synthesis and an application of i) Silicone rubber ; ii) Teflon. **(06 Marks)**

d. What are the deficiencies of natural rubber? Explain vulcanization of rubber. **(05 Marks)**

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

i) Chloride content of water sample is determined by

A) Colorimetric method B) Argentometric method

C) SPADNS method D) Gravimetric method

ii) As the temperature increases, the amount of dissolved oxygen of water sample

A) Increases B) Decreases

C) Has no effect D) None of the above

iii) Reverse osmosis is a method of getting pure water from

A) Sewage water B) Industrial waste water

C) Sea water D) River water

iv) Estimation of total hardness of water using EDTA titrant involves

A) Neutralisation reaction B) Redox reaction

C) Precipitation reaction D) Complexometric reaction

b. How is alkalinity of water caused? Explain the method of determination of alkalinity. **(06 Marks)**

c. Describe electrodialysis method of desalination of water. **(06 Marks)**

d. 25 CC of waste water was mixed with 25 CC of $K_2Cr_2O_7$, acidified and refluxed. The unreacted $K_2 Cr_2O_7$ required 8.2 CC of 0.2N FAS. In a blank titration 25 CC of $K_2Cr_2O_7$ acidified required 16.4 CC of same FAS. Calculate COD of waste water. **(04 Marks)**

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10PHY12/22

First/Second Semester B.E. Degree Examination, December 2011

Engineering Physics

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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***
4. ***Physical constants : $c = 3 \times 10^8$ m/s, $h = 6.63 \times 10^{-34}$ JS, $e = 1.602 \times 10^{-19}$C, $m_e = 9.1 \times 10^{-31}$ kg, $N_A = 6.02 \times 10^{26}$/Kmole, $\epsilon_0 = 8.85 \times 10^{-12} Fm^{-1}$, $k = 1.38 \times 10^{-23} JK^{-1}$.***

PART – A

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

i) The wavelength (λ) associated with a particle of mass, m, moving with velocity V is given by

A) $\lambda = \frac{h}{mV}$ B) $\lambda = \frac{mV}{h}$ C) $\lambda = \frac{hV}{m}$ D) $\lambda = \frac{m}{hV}$

ii) The law which describes the blackbody radiation completely is
A) Planck's law B) Stefan's law
C) Wien's law D) Rayleigh-Jean's law

iii) Davisson and Germer experiment relates to
A) interference B) polarization
C) electron diffraction D) phosphorescence

iv) The group velocity of the particle is 3×10^6 m/s, whose phase velocity is
A) 6.06×10^6 m/s B) 3×10^{10} m/s
C) 3×10^6 m/s D) 1.5×10^{10} m/s

b. What is the matter wave? Derive an expression for de-Broglie wavelength using group velocity concept. **(05 Marks)**

c. Find the energy of the neutron in eV whose de-Broglie wavelength is 1Å. **(04 Marks)**

d. Describe Davisson and Germer experiment for the justification of de-Broglie hypothesis. **(07 Marks)**

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

i) The equation of motion of matter was derived by
A) Heisemberg B) Bohr C) de-Broglie D) Schroedinger

ii) The product of uncertainties between position and momentum is given by

A) $\Delta x \, \Delta p \geq \lambda$ B) $\Delta x \, \Delta p \geq \frac{\hbar}{2}$ C) $\Delta x \, \Delta p \geq mV$ D) $\Delta x \, \Delta p \geq n\hbar$

iii) Which of the following functions cannot be accepted as solutions for Schroedinger's time independent equation for all values of x?
A) $a \sin x$ B) $a \cos x$ C) $a \sec x$ D) $a \sin x + b \cos x$

iv) The energy corresponding to the first permitted energy level for a particle in an infinite potential well is called
A) excited energy B) zero point energy
C) meta stable state energy D) none of these.

2 b. Obtain the time independent Schroedinger wave equation. **(07 Marks)**

c. An electron is confined to a box of length 10^{-9} m, calculate the minimum uncertainty in its velocity. **(05 Marks)**

d. Show that electrons cannot exist in the nucleus of an atom. **(04 Marks)**

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

i) For ordinary metals, the resistivity verses temperature curve at T = 0 K
A) has a positive intercept B) has a negative intercept
C) goes through the origin D) none of these

ii) At T >0 K, the probability of occupancy of Fermi level is
A) 75% B) 90%
C) 100% D) 50%

iii) If the mobility of electron in a metal increases, the resistivity
A) decreases B) increases
C) remains constant D) none of these

iv) The dependence of mean free path λ on temperature T is
A) $\lambda \alpha T$ B) $\lambda \alpha \sqrt{T}$
C) $\lambda \alpha \frac{1}{T}$ D) $\lambda \alpha \frac{1}{\sqrt{T}}$

b. Using the free electron theory, derive an expression for electrical conductivity in metals. **(05 Marks)**

c. Explain Fermi energy and Fermi factor. **(06 Marks)**

d. Calculate the Fermi velocity and the mean free path for the conduction electrons in silver, given that its Fermi energy is 5.5 eV and the relaxation time for electrons is 3.97×10^{-14} s. **(05 Marks)**

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

i) Electronic polarization _____.
A) increases with temperature B) decreases with temperature
C) independent of temperature D) none of these

ii) The polarization produced in a dielectric medium of relative permittivity 16 in presence of an electric field of 500 V/m is ____.
A) $7500 \in_0$ B) $1500 \in_0$
C) $1600 \in_0$ D) none of these

iii) The susceptibility of a dielectric depends on
A) intensity of the applied field
B) the dielectric polarization
C) the ratio of dielectric polarization and the intensity of the applied field
D) the ratio of the intensity of the applied field and the dielectric polarization.

iv) Piezoelectric effect is used to convert _____ energy into _____ energy.
A) mechanical, electrical B) electrical, mechanical
C) thermal, electrical D) none of these

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

c. The dielectric constant of sulphur is 3.4. Assuming a cubic lattice foe its structure, calculate the electric polarizability of sulphur. Given density = 2.07×10^3 kg/m^3 and at weight = 32.07. **(05 Marks)**

d. Distinguish between hard and soft magnetic materials. **(04 Marks)**

PART – B

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

i) Emission of a photon by an excited atom due to interaction of external energy is called
A) spontaneous emission B) stimulated emission
C) induced absorption D) light amplification.

ii) Pumping process used in diode laser is
A) optical pumping B) forward bias
C) electrical discharge D) none of these

iii) Image is stored on a hologram in the form of
A) interference pattern B) diffraction pattern
C) photography D) none of these

iv) Important characteristic of laser beam is
A) interference B) diffraction C) dispersion D) coherence

b. Describe the construction of He-Ne laser and explain its working, with the help of energy level diagram. **(06 Marks)**

c. Describe the recording and reconstruction process in holography, with the help of suitable diagrams. **(06 Marks)**

d. A He-Ne gas laser is emitting a laser beam with an average power of 4.5 mw. Find the number of photons emitted per second by the laser. The wavelength of the emitted radiation is 6328 $\mathring{A}$. **(04 Marks)**

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

i) The numerical aperture of an optical fibre of which refractive indices of the core and cladding are 1.563 and 1.498, is
A) 0.446 B) 1.043 C) 0.958 D) none of these

ii) Attenuation is the _____ in power of light as it travels in the fibre.
A) amplification B) reduction C) gain D) none of these

iii) The superconductor behaves like a perfect
A) paramagnet B) Ferro magnet C) diamagnet D) none of these

iv) Below critical temperature, if the temperature of superconductor is increased, the critical field
A) increases B) decreases
C) remains constant D) first increases, then decreases

b. Discuss Meissner effect. **(05 Marks)**

c. Obtain and expression for the numerical aperture. **(05 Marks)**

d. The refractive indices of the core and cladding of a step index optical fibre are 1.45 and 1.40 respectively and its care diameter is 45 μm. Calculate its relative refractive index difference, V-number at wavelength 1000 nm and the number of modes. **(06 Marks)**

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

i) The number of atoms per unit cell in diamond is
A) 1 B) 2 C) 4 D) 8

ii) Miller indices of a plane parallel to X and Y axes are
A) (0 0 1) B) (1 0 0) C) (0 1 0) D) (1 1 0)

7 a. iii) In a Bragg's X-ray spectrometer, for every rotation θ of the turn table, the ionization chamber turns by an angle of

A) θ B) 2θ C) 3θ D) 4θ

iv) The grating space of calcite is 3.036 Å and for the first order Bragg reflection, the glancing angle is 12°. The path difference between the rays is

A) 0.63 Å B) 6.3 Å C) 1.262 Å D) 12.62 Å

b. Explain in brief the seven crystal systems, with neat diagrams. **(07 Marks)**

c. Monochromatic X-rays of wavelength 0.82 Å undergo first order Bragg reflection from a crystal of cubit lattice with lattice constant 3 Å at a glancing angle of 7.855 Å. Identify the possible planes which give rise to this reflection in terms of their Miller indices. **(06 Marks)**

d. Derive Bragg's equation. **(03 Marks)**

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

i) The bulk material reduced in two direction is known as

A) quantum dot B) quantum wire

C) film D) reduced structure

ii) The state of matter around the nano size is known as

A) solid state B) liquid state

C) plasma state D) mesoscopic state

iii) Ultrasonic waves can exist as longitudinal waves in

A) solids B) liquids C) gases D) all of these

iv) The elastic behaviour of a liquid is characterized by its

A) Young's modulus B) modulus of rigidity

C) bulk modulus D) Poisson's ratio

b. Describe with simple illustrations, the two methods of preparation of nanomaterial. **(08 Marks)**

c. What are ultrasonics? Describe a method of measuring velocity of ultrasonics waves in solids. **(08 Marks)**

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10CCP13/23

First/Second Semester B.E. Degree Examination, December 2011
Computer Concepts and C Programming

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions choosing at least two from each part.***
2. ***Answer all objective type questions only in OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART - A

1. a. Select the correct answer : **(04 Marks)**

i) The general name given to the physical parts of a computer is ___
A) Software B) Hardware C) Firmware D) Computer ware

ii) A byte contains _____ number if bits.
A) 12 B) 8 C) 16 D) 32

iii) Which of these is not an example of software?
A) Utilities B) Operating system
C) Floppy disk D) Device drivers

iv) Which of these is not a part of information processing cycle?
A) Data sharing B) Data collection
C) Data storage D) Data output

b. Mention the various steps associated with the information processing cycle and explain them. **(08 Marks)**

c. What is a data scanning device? Mention any four such devices. **(04 Marks)**

d. i) Convert the binary number 1 1 1 0 0 1 1 1 to decimal number.
ii) Convert the decimal number 55 to binary number. **(04 Marks)**

2. a. Select the correct answer : **(04 Marks)**

i) A translator which reads a high level program line by line and converts its into machine language code is _____
A) Translator B) Interpreter C) Compiler D) Assembler

ii) The size of most commonly used floppy these days is
A) 8 inch B) 3.5 inch C) 5.25 inch D) 2.5 inch

iii) Which of these is not a network topology?
A) Bus B) Ring C) Star D) Square

iv) Which of these is not a type of translator
A) Assembler B) Interpreter C) Compiler D) Integrator

b. Mention the various functions of an operating system. Explain any two of them. **(08 Marks)**

c. List and explain the basic components of a computer network. **(04 Marks)**

d. Mention the different storage devices and explain one of them. **(04 Marks)**

3. a. Select the correct answer : **(04 Marks)**

i) Which of the following is associated with software changes / modification / evolution of software?
A) Design B) Coding C) Testing D) Maintenance

ii) The type of programming that is done using C is
A) High level B) Low level
C) Both A & B D) None of these

iii) The function which takes a single character input from the keyboard is _____
A) get chr B) get char C) give char D) char get

iv) Which of these is not a key word to C language?
A) float B) static C) delete D) insert

b. What are C tokens? Mention them. Explain any two of them. **(08 Marks)**

c. What is a datatype? Mention the basic data types available in C. **(04 Marks)**

d. What are variables? How are they declared? **(04 Marks)**

4. a. Select the correct answer : **(04 Marks)**

i) The order in which different operations in an expression are evaluated is decided by _____
A) Associativity B) Precedence C) Evaluation D) Format

ii) The correct version of the clause to include I/O funciton library in C program is
A) # include < io.h > B) # include < Std io.h >
C) include # < io.h > D) include # < Std io.h >

iii) The result of evaluating the expression 7% 5 + 10.0 * 10/3 is _____
A) 32.0 B) 32 C) 31.0 D) 31

iv) Let K = 12, i = 3, J = 5. Consider the statement K + = i + J + + ; After execution the values of k. i. J respectively are
A) 21, 3, 6 B) 20, 3, 6 C) 21, 3, 6 D) 20, 4, 6

b. Explain the structure of 'C' program. **(06 Marks)**

c. Write a program to find the area of a triangle given the three sides. **(06 Marks)**

d. With examples, illustrate any four common programming errors. **(04 Marks)**

PART - B

5. a. Select the correct answer : **(04 Marks)**

i) Which of the following will not be terminated by a semicolon sign?
A) Function prototype B) Function calling statement
C) Function definition D) None of these

ii) A function that calls itself is _____
A) Nested function B) Overloaded function
C) Recursive function D) Inline function

iii) The scope of the variables defined in a function is _____
A) Local B) Modular C) Global D) Universal

iv) The parameters used in a function call are called _____ parametes.
A) Formal B) Dummy C) Actual D) None of these

b. Mention the different ways of passing parameters to the function. Explain one of them. **(08 Marks)**

c. Write a program to accept two integers and swap their values using a function to swap. **(08 Marks)**

6. a. Select the correct answer : **(04 Marks)**

i) The correct statement for checking a condition in if statement is
A) if (a = b) B) if (a = = b) C) if (a, b) D) if (a b)

ii) The loop in which the number of iterations remain known prior to the execution of the loop is _____
A) for B) while C) do while D) None of these

iii) The value of switch expression must be of type _____
A) Real B) int C) double D) All of these

iv) The least number of times the do – while loop will be executed is _____
A) 0 B) 1 C) 2 D) Both A and B

b. Distinguish between while and do-while statement. **(08 Marks)**

c. Write a C program to read a positive number and reverse the given number. **(08 Marks)**

7. a. Select the correct answer : **(04 Marks)**

i) Number of elements in an array defined by a [3] [4] is
A) 8 B) 12 C) 16 D) None of these

ii) If $\chi[4]$ is a declaration, then the first and last array index will be
A) 1, 4 B) 0, 3 C) 3, 0 D) None of these

iii) Given int a [3] [2] = {1, 2, 3, 4, 5, 6} ; the element in the 3rd row and 2nd column is _____
A) 3 B) 6 C) 52 D) 4

iv) A function that is used to join two strings is _____
A) Strepy B) Strlen C) Streat D) Stremp

b. Explain the declaration and initialization of one dimensional array with examples. **(06 Marks)**

c. Write a C program to input N integers into a single dimensional array and sort them in descending order using bubble sort method. Print both given array and sorted array with suitable headings. **(10 Marks)**

8. a. Select the correct answer : **(04 Marks)**

i) _____ execution of instructions in a computer system is referred to as parallel computing.
A) Serial B) Sequential C) Accurate D) Simultaneous

ii) Which of the following can be used as a resource in parallel computing?
A) A single computer with multiple processors.
B) An arbitrary number of computers connected by a network.
C) A combination of the above.
D) All of these.

iii) Open Mp stands for ____
A) Open multi – parallelism B) Organised multi – programming
C) Open multi – processing D) Organised multi – parallelism.

iv) An example of environment variable in OPEN MP is
A) Omp – thread – limit B) Omp – init – lock
C) Omp – test – lock D) Omp – get – dynamic.

b. Define concurrent processing. What is the motivation for concurrent processing? **(10 Marks)**

c. What are threads? Give the advantages and disadvantages of multiple threads. **(06 Marks)**

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10CIV13/23

First/Second Semester B.E. Degree Examination, December 2011
Elements of Civil Engineering and Engineering Mechanics

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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART – A

1 a. Select the correct answer : **(04 Marks)**

i) Abuttment is a part of
A) Road B) Bridge C) Dam D) Building

ii) Which of the following is not an irrigation infrastructure?
A) Dam B) Canal C) Jackwell D) Road

iii) Surveying mainly deals with
A) Communication B) Environment C) Material D) Measurement

iv) Geotechnical engineering mainly deals with
A) Space B) Air C) Earth D) Water

b. What are the purposes of dam? Name any four types of dams. **(08 Marks)**

c. Name : i) Types of roads ii) Types of bridges. **(08 Marks)**

2 a. Select the correct answer: **(04 Marks)**

i) Two forces having the same line of action are called
A) Coplanar parallel forces B) Non coplanar concurrent forces
C) Coplanar non concurrent forces D) Collinear forces

ii) The magnitude of the moment is zero, when the force is applied _____ the lever.
A) Perpendicular to B) Inline with C) At any angle to D) at 60° to

iii) Following is the unit of moment of a force
A) N B) Nm^2 C) N^2m D) Nm

iv) If two forces are parallel, then they cannot be
A) Coplanar B) Concurrent C) Non coplanar D) Non concurrent

b. A block of weight 200N is kept on the inclined plane and is fixed to the plane. Find the component of weight in the direction along the plane and perpendicular to the plane as indicated (Refer Fig. Q.2(b)) **(04 Marks)**

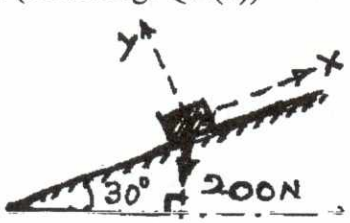

Fig. Q.2(b)

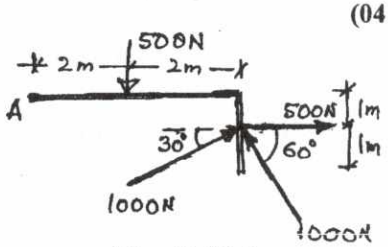

Fig. Q.2(c)

c. Replace the force system shown in Fig. Q.2(c) by a single force passing through A and moment of a couple. **(06 Marks)**

d. State Newton's laws of motion. **(06 Marks)**

3 a. Select the correct answer : **(04 Marks)**

i) The resultant of two concurrent forces becomes minimum if angle between them is _____

A) Zero B) 180° C) 90° D) 60°

ii) If two concurrent forces each of magnitude P act at right angles to each other, their resultant is

A) 2P B) Zero C) $P\sqrt{2}$ D) (P/2)

iii) The magnitudes of two given forces are 40N and 60N. Which of the following cannot be their resultant?

A) 20N B) 30N C) 40N D) 120N

iv) If the magnitude of resultant of two forces, of each magnitude P, is P, then the angle between the two forces is

A) Zero B) 45° C) 120° D) 60°

b. Compute the resultant of the forces, (Refer Fig.Q.3(b)) **(08 Marks)**

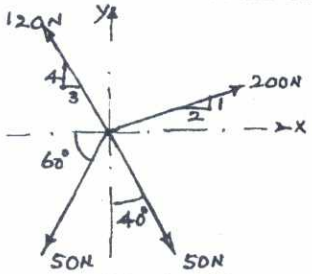

Fig.Q.3(b)

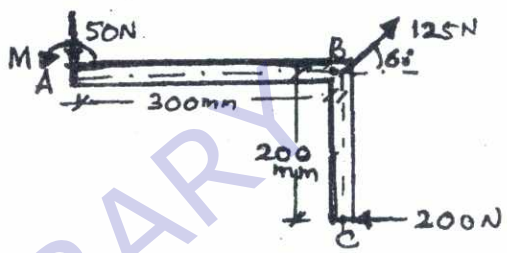

Fig. Q.3(c)

c. The three forces and a moment are applied to a bracket as shown in Fig. Q.3(c). Determine the moment, M, if the line of action of the resultant of the forces is to pass through B. Compute the resultant of the three forces and the moment. **(08 Marks)**

4 a. Select the correct answer : **(04 Marks)**

i) Moment of total area about its centroidal axis is _____

A) Twice the area B) Three times the area

C) Zero D) Area x(centroidal distance)^2

ii) For a steel ball of radius, R, _____

A) The centroid and centre of gravity are different

B) The centroid and centre of gravity are same

C) The centroid is half the centre of gravity D) None of these

iii) The co-ordinates of the centroid of a quadrant of a circle of radius, r is

A) $\bar{x} = \frac{4r}{3\pi}$, $\bar{y} = r$ B) $\bar{x} = r$, $\bar{y} = \frac{4r}{3\pi}$ C) $\bar{x} = \frac{4r}{3\pi}$, $\bar{y} = \frac{4r}{3\pi}$ D) $\bar{x} = r$, $\bar{y} = r$

iv) If the given plane figure is symmetrical about y–y axis only, then the centroid lies on —

A) The intersection of x–x axis and y–y axis B) x–x axis

C) y–y axis D) None of these

b. Determine the centroid of a semi circular area of radius r using method of integration. **(08 Marks)**

c. Locate the centroid of the shaded area. (All dimensions are in mm Refer Fig. Q.4(c)) **(08 Marks)**

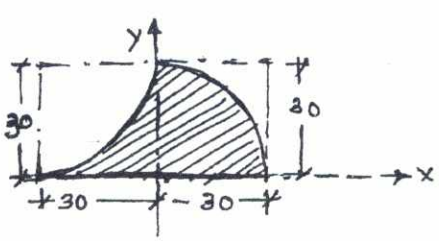

Fig. Q.4(c)

PART – B

5 a. Select the correct answer : **(04 Marks)**

i) A particle acted upon by two forces of equal magnitude having the same line of action is in equilibrium. The angle between the two forces is _____

A) 0° B) 90° C) 180° D) 45°

ii) For equilibrium of a body subjected to coplanar non concurrent forces, the _____

A) $\sum Fx = 0$ and $\sum Fy = 0$ B) $\sum Fx = 0$ and $\sum M = 0$

C) $\sum m = 0$ D) $\sum Fx = 0$, $\sum Fy = 0$ and $\sum m = 0$.

iii) Lami's theorem can be applied when _____ forces act on a body in equilibrium

A) Two B) Three C) Four D) None of the above

iv) A block of weight, W, is kept on a frictionless inclined plane making an angle, θ with the horizontal. The horizontal force, P, required to keep the block in equilibrium is

A) W sin θ B) (W/2)tan θ C) W tan θ D) (W/tan θ)

b. The collar of weight 264.6N may slide on a frictionless vertical rod and is connected to a 294N counter weight, C. Determine the value of 'h' for which the system is in equilibrium (Refer Fig. Q.5(b)) **(06 Marks)**

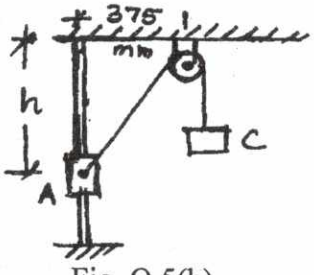

Fig. Q.5(b)

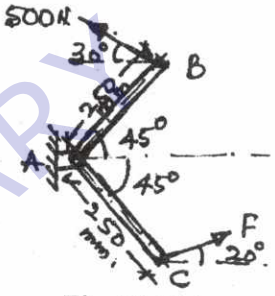

Fig. Q.5(c)

c. Find the force, F acting on the crank for equilibrium and also find the reaction at support. Refer Fig. Q.5(c) both arms of the crank are of 250mm length **(10 Marks)**

6 a. Select the correct answer : **(04 Marks)**

i) For a beam, if one end is supported on roller and the other on hinge, the beam is said to be

A) Fixed B) Hinged C) Cantilever D)Simply supported

ii) For a fixed end of a beam, the number of reaction components are _____

A) Three B) Two C) One D) Zero

iii) A cantilever beam is one in which _____

A) Both ends are fixed B) One end is fixed and other is free

C) Both ends are hinged D) Both ends are free

iv) A horizontal simply supported beam AB of length 5m is acted upon by a vertical point load of 10kN at a distance of 2m from A. The reactions of A and B respectively are

A) 4kN and 6kN B) 6kN and 4kN C) 5kN and 5kN D) 10kN and zero

b. Calculate the reactions at A, for the beam shown in Fig. Q.6(b). The beam is hinged at A and supported by cable at C. Self weight of the beam is 2kN/m (udl) as indicated. **(06 Marks)**

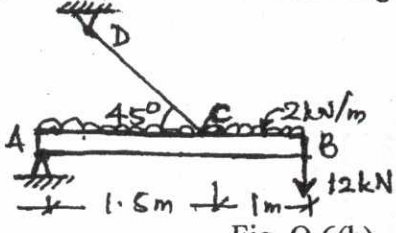

Fig. Q.6(b)

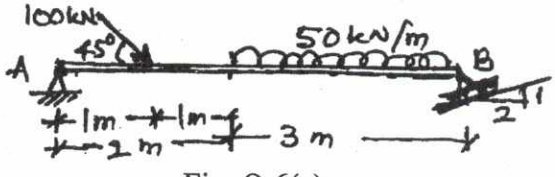

Fig. Q.6(c)

c. For the beam shown in Fig. Q.6(c), calculate the reactions at the supports. (Hinged support at A and roller support at B) **(10 Marks)**

7 a. Select the correct answer : **(04 Marks)**

i) Angle of friction is angle between _____
A) The incline and horizontal B) The normal reaction and friction force
C) The weight of the body and friction force D) Normal reaction and resultant

ii) The force of friction depends upon_____
A) Area of contact B) Roughness of surface
C) Both area of contact and roughness of surface D) None of these

iii) Compared to static friction, kinetic friction is _____
A) Greater B) Smaller C) Zero D) Very large

iv) If θ is the angle of friction and α is the angle of repose then which relation is correct?
A) $\theta = \frac{1}{\alpha}$ B) $\theta = \alpha$ C) $\theta = \tan\alpha$ D) $\alpha = \tan\theta$.

b. The position of the machine block B is adjusted by moving the wedge A. Knowing that the coefficient of static friction is 0.35 between all surfaces of contact, determine the force, P required to raise the block. B neglect the weight of wedge. (Refer Fig. Q.7(b). Weight of block B is 2kN. **(10 Marks)**

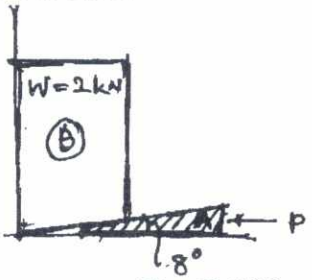

Fig. Q.7(b)

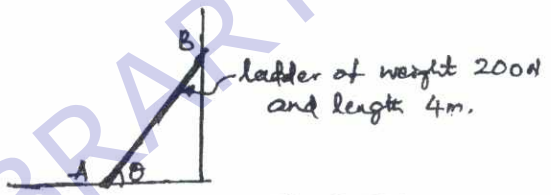

Fig. Q.7(c)

c. A ladder of 4m weighing 200N is supported by a horizontal floor and vertical wall as shown in Fig. Q.7(c). If a man of weight 650N climbs to the top of the ladder, determine the indication of the ladder with reference of the floor at which the ladder is to be placed to prevent slipping. Take the co–efficient of friction for all surfaces of contact as 0.25. **(06 Marks)**

8 a. Select the correct answer : **(04 Marks)**

i) The moment of inertia of a circle of diameter D about its centroidal axis is _____
A) $\pi D^2/32$ B) $\pi D^2/64$ C) $\pi D^4/32$ D) $\pi D^4/64$

ii) Moment of inertia is a _____
A) First moment of area B) Second moment of area
C) Third moment of area D) None of these

iii) Polar moment of inertia of a plane area is _____
A) Ixx X Iyy B) Ixx + Iyy C) Ixx / Iyy D) None of these

iv) The unit of moment of inertia of an area is _____
A) m^2 B) m C) m^4 D) m^3

b. State and prove parallel axis theorem : **(06 Marks)**

c. Find the moment of inertia of plane lamina (shaded) shown in Fig. Q.8(c) about x–x axis as indicated. **(10 Marks)**

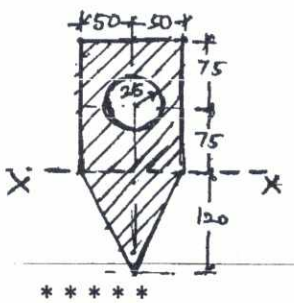

Fig. Q.8(c)

All dimensions in mm

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10EME14/24

First/Second Semester B.E. Degree Examination, December 2011
Elements of Mechanical Engineering

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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***
4. ***Use of steam tables is permitted.***

PART – A

1 a. Select the correct answer : **(04 Marks)**

i) The process in which using the principle of photo voltaic effect, the steam energy is directly converted into electrical energy is
A) Helio electrical process B) Helio thermal process
C) Mechanical process D) None of these

ii) The difference between superheated temperature and the saturation temperature of steam is called
A) Degree of superheat B) Latent heat vapourization
C) Sensible heat D) None of these

iii) Quality of wet steam is decided by its
A) Temperature B) Pressure C) Dryness fraction D) None of these

iv) Specific volume of superheated steam (Vsup) with usual notations is

A) $= V_g X \frac{T_{sat}}{T_{sup}}$ B) $= V_g X \frac{T_{sup}}{T_{sat}}$ C) $= V_f X \frac{T_{sat}}{T_{sup}}$ D) $= V_f X \frac{T_{sup}}{T_{sat}}$

b. Differentiate between renewable and non-renewable sources of energy. **(06 Marks)**

c. 10Kg of wet steam of dryness fraction 0.8, passes from a boiler to superheater at a constant pressure of 1MPa. In the superheater its temperature increases to 340°C. Determine the amount of heat supplied in the superheater. Assume specific heat of superheated steam Cp = 2.25KJ/Kg°K. **(10 Marks)**

2 a. Select the correct answer : **(04 Marks)**

i) Utilization of the high pressure energy of the steam by expanding it in successive stages is called.
A) Impulse turbine B) Reaction turbine C) Compounding D) None of these

ii) Pelton wheel is a
A) Law head impulse turbine B) Medium head impulse turbine
C) High head impulse turbine D) Reaction turbine

iii) In case of impulse water turbine, the entire hydro energy is converted into kinetic energy by passing the water through
A) Tailrace B) Runner C) Nozzle D) None of these

iv) The cross–section of a draft tube in a turbine
A) Is uniform B) Gradually decreases towards the outlet
C) Gradually increases towards the outlet D) None of these

b. Explain the working principle of operation of impulse and reaction turbines. **(06 Marks)**

c. Sketch and explain the working of a pelton wheel. **(10 Marks)**

3 a. Select the correct answer : **(04 Marks)**

i) In a four stroke C.I. engine, during suction stroke :
A) Only air is sucked in B) Only diesel is sucked in
C) Both air and diesel sucked in D) Either diesel or air is sucked in

ii) In two stroke engines, the number of revolutions made by the crank to complete one cycle is
A) One B) Two C) Three D) Four

iii) The brakepower of an engine is always ..... the indicated power
A) Equal to B) Less than C) Greater than D) Reciprocal of

iv) The inner diameter of engine cylinder is called as
A) Stroke B) Clearance C) Bore D) Pitch

b. With neat sketches, explain the working of 2–stroke petrol engine. **(08 Marks)**

c. A single cylinder 4–stroke I.C. engine has bore of 180mm, stroke of 200mm and a rated speed of 300rpm. Torque on the brakedrum is 200N–m and mean effective pressure is 6 bar. It consumes 4kg of fuel per hour. The calorificvalue of fuel is 42000KJ/Kg. Determine B.P, I.P, Brake thermal efficiency and mechanical efficiency. **(08 Marks)**

4 a. Select the correct answer : **(04 Marks)**

i) An ideal refrigerant should have
A) Low specific heat B) Low viscosity
C) High thermal conductivity D) All of these

ii) The principle of refrigeration is based on
A) Law of conservation of energy B) I law of thermodynamics
C) II law of thermodynamics D) Zeroth law of thermodynamics

iii) The ratio of heat extracted from the refrigerator to the work done is called
A) Performance ratio B) Thermal efficiency
C) Co-efficient of performance D) Performance index

iv) The most commonly used refrigerant in vapour absorption refrigeration system is
A) Freon B) CO_2 C) SO_2 D) NH_3

b. Explain Vapour Absorption refrigeration system. **(08 Marks)**

c. Explain room air conditioner system. **(08 Marks)**

PART – B

5 a. Select the correct answer : **(04 Marks)**

i) The process of thread cutting on a drilling machine is called as
A) Spot facing B) Reaming C) Tapping D) Boring

ii) The operation of finishing the inner surface of a drilled hole in called as
A) Spot facing B) Reaming C) Tapping D) Boring

iii) To drill a hole on a lathe, a drill bit is held in the
A) Toolpost B) Tailstock spindle C) Head stock D) Compound rest

iv) Which of these drilling machines is used for mass production?
A) Bench drilling machine B) Radial drilling machine
C) Gang drilling machine D) Portable drilling machine

b. Draw a neat sketch of a lathe and label its parts. **(10 Marks)**

c. Differentiate between counter sinking and counter boring. **(06 Marks)**

6 a. Select the correct answer : **(04 Marks)**

i) Irregular shape of machining is done in
A) Angular milling B) Form milling C) Gang milling D) End milling

ii) ..... is a type of artificial abrasive.
A) Sand stone B) Corundum C) Emery D)Aluminium oxide

iii) In vitrified bonding process, the abrasive grains are mixed with
A) Clay and water B) Silicate of soda C) Shellac D) Rubber

iv) The horizontal shaft used to mount the milling cutter is called
A) Spindle B) Connecting rod C) Saddle D) Arbor

b. Draw a neat sketch of column and knee type horizontal milling machine and explain its working. **(10 Marks)**

c. Sketch and explain the following operations **(06 Marks)**
i) Surface grinding ii) Cylindrical grinding

7 a. Select the correct answer : **(04 Marks)**

i) Fusion welding is also known as.....
A) Pressure welding B) Resistance welding
C) Non-pressure welding D) Thermit welding

ii) The filler material used in brazing is .....
A) Solder B) Flux C) Spelter D) Electrode

iii) As the oil temperature increases, its viscosity .....
A) Increases B) Decreases
C) Will remain constant D) None of these

iv) A bearing in which the load acts along the axis of the shaft is called as
A) Thrust bearing B) Journal bearing C) Roller bearing D) Ball bearing

b. What are the desirable properties of a good lubricant? **(06 Marks)**

c. Distinguish between soldering, brazing and welding. **(10 Marks)**

8 a. Select the correct answer : **(04 Marks)**

i) The pulley which is used to increase the arc of contact is
A) Stepped pulley B) Speed cone
C) Jockey pulley D) Fast and loose pulley

ii) The ratio of speeds of the driver and driven pulley is
A) Ratio of tensions B) Module
C) Pitch circle diameter D) Velocity ratio

iii) The gear used to connect coplanar, parallel and Non–parallel axes shaft is
A) Helical gear B) Spur gear C) Bevel gear D) Worm gear

iv) To convert rotary motion into linear motion which of the following gear is used?
A) Spur gear B) Bevel gear C) Rackand pinion D) None of these

b. Define slip and creep with respect to belt drives. **(06 Marks)**

c. Mention the advantages and disadvantages of belt drive. **(06 Marks)**

d. A compound gear train is formed by 4 gears P.Q.R and S. Gear P meshes gear Q and R meshes gear S. Gear Q and R are compounded. P is connected to the driving shaft and S is connected to the driven shaft and power is transmitted, the details of the gears are given below. Find speed of gear P. if gear S rotates at 60rpm **(04 Marks)**

Gears	P	Q	R	S
No of teeth	30	60	40	80

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10ELN15/25

First / Second Semester B.E. Degree Examination, December 2011

Basic Electronics

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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART – A

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

i) The voltage at which forward current through the diode starts increasing rapidly is called as ———
A) Saturation voltage B) Breakover voltage C) cut in voltage D) cut off voltage.

ii) Dynamic zener resistance is ——— in reverse breakdown condition.
A) very high B) high C) zero D) very small

iii) Smaller the ripple factor, the output will have higher ——— components.
A) AC B) DC C) Both AC and DC D) Pulse

iv) The transformer utilization factor of a bridge type full wave rectifier is ———
A) 0.287 B) 0.812 C) 0.864 D) 0.48

b. Draw the AC equivalent circuit of a diode. **(04 Marks)**

c. With a circuit diagram, explain the working of a centre – tapped FWR. **(06 Marks)**

d. Prove that ripple factor of a HWR is 1.21. **(06 Marks)**

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

i) The current conduction in bipolar junction transistor is because of ———
A) Electrons B) Holes C) Both electrons and holes D) Current

ii) In cut off region both base – to – collector and base to emitter junctions are ——
A) forward biased B) ON C) Reverse biased D) None of these

iii) In a transistor $I_B = 30$ mA and $I_E = 10$ mA. What is the value of α ?
A) 0.92 B) 0.99 C) 0.98 D) 0.96

iv) In CB– mode of a transistor when the reverse bias voltage increases, the width of depletion region also increases, which reduces the electrical base width called as ——
A) Depletion width B) Early effect
C) cut in D) punch through effect

b. What are the advantages of transistor over vacuum tube? **(04 Marks)**

c. Draw and explain the input and output characteristics of CE configuration of a transistor. **(06 Marks)**

d. For the CE – circuit shown in Fig. 2(d), draw the DC load line and obtain Q–point values. Assume $\beta = 100$ and $V_{BE} = 0.7V$. **(06 Marks)**

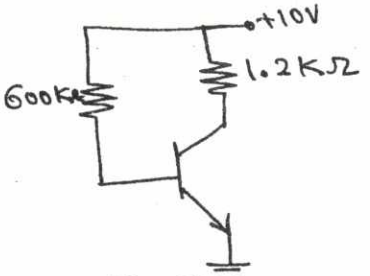

Fig. Q2(d)

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

i) Ideally stability factor should be zero to get ——— Q–point.
A) Unstable B) Centre of the cutoff
C) Stable D) None

ii) Which of the following factor affects the Q–point stability?
A) I_{CO} B) Coupling capacitor
C) Emitter resistor D) Bypass capacitor.

iii) In what biasing circuit voltage shunt negative feed back is provided?
A) Voltage divider biasing B) Fixed bias
C) Collector to base bias D) Emitter bias.

iv) Fixed bias circuit provides ——— stability
A) Poor B) High
C) Better D) Very good

b. For the circuit shown in Fig. Q3(b), $I_C = 2$ mA, $\beta = 100$, and $V_{CE} = 3V$. Calculate R_1 and R_C. Assume $V_{BE} = 0.6V$. **(08 Marks)**

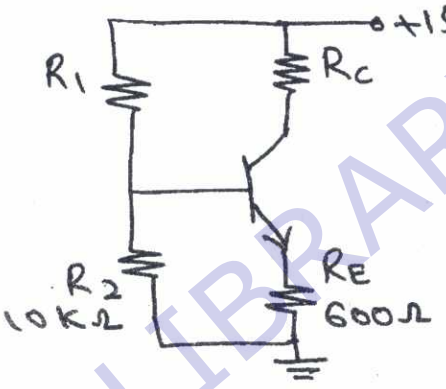

Fig. Q3(b)

c. What factors cause instability of a Q–point? Explain it. **(08 Marks)**

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

i) JFET is a ——— device
A) Bipolar B) Unipolar C) Uni–Bipolar D) None of these

ii) PNPN device is an ———
A) UJT B) SCR C) MOSFET D) BJT

iii) The UJT relaxation oscillator is used to generate _____
A) Square wave signal B) Rectangular wave signal
C) Sine wave signal D) Triggering pulse

iv) The holding current in SCR is ——— latching current
A) More than B) Less than C) Equal to D) None of these

b. Draw the equivalent circuit of a UJT and mention its applications. **(04 Marks)**

c. What are the applications of SCR? **(04 Marks)**

d. Draw the drain characteristics of a n–channel JFET and explain it. **(08 Marks)**

PART - B

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

i) If the voltage gain of the amplifier is 0.001, what is the value of gain is dB's?
A) – 60 B) – 62 C) 60 D) 100

ii) With negative feedback, the bandwidth of an amplifier _____
A) Decreases B) Increases C) Both A & B D) Constant

iii) In oscillator circuit _____ feedback is used
A) Voltage series B) Positive C) Negative D) Both +ve and –ve

iv) In RC – phase shift oscillator each section of RC – network produces phase shift of - ___
A) 60° B) 30° C) 180°. D) 90°

b. With a neat diagram, explain the operation of a Colpitt's oscillator. **(08 Marks)**

c. Explain the operation of single stage RC coupled amplifier and draw its frequency response. **(08 Marks)**

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

i) For a differential amplifier $A_d = 10000$ and CMRR = 10^8. What is the value of A_c?
A) $= 10^{-4}$ B) 10^{-6} C) 10^4 D) 100

ii) For an inverting op–amp if $R_1 = R_F$ then circuit is called_____
A) Sign changer B) Sign multiplier C) +ve sign D) None of these

iii) The ideal bandwidth of an op–amp is _____
A) Zero B) Infinity C) High D) Medium

iv) Buffer and level shifter is usually a
A) Current follower B) Collector follower
C) Resistance follower D) Emitter follower

b. Define the following terms with respect to op–amps
i) Slew rate ii) Power supply rejection ratio iii) CMRR. **(06 Marks)**

c. Derive the expression of output voltage of a op–amp differentiator. **(05 Marks)**

d. Determine the output voltage for the op–amp adder circuit shown in Fig. Q.6(d). **(05 Marks)**

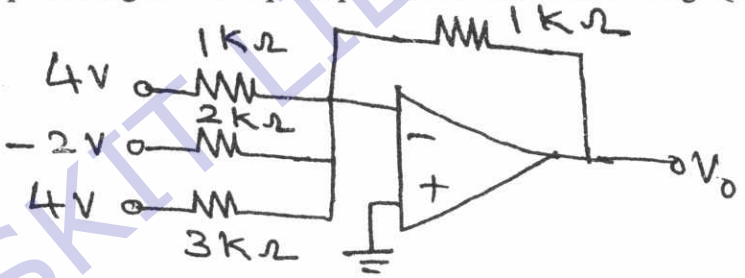

Fig. Q.6(d)

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

i) The carrier frequency is _____ modulating frequency
A) Lower than B) Higher than C) Equal to D) None of these

ii) The bandwidth of AM wave is _____
A) 2fm B) fm C) fm/2 D) None of these

iii) Find the decimal equivalent of $(10AB)_{16}$.
A) 3267 B) 4265 C) 4268 D) 4267

iv) What is the binary equivalent of $(1126)_8$?
A) 001 001 010 110 B) 100 001 010 110
C) 110 110 001 001 D) 001 001 110 010

b. Draw the block diagram of superheterodyne receiver and explain the function of each block **(08 Marks)**

c. Convert $(BCDE)_{16} = (\ )_2 = (\ )_8 = (\ )_{10}$. **(03 Marks)**

d. Subtract $(57)_{10}$ from $(43)_{10}$ using 2's complement from. **(05 Marks)**

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

i) For NAND– Gate both inputs are high, then output will be _____

A) High B) Low C) Tristate D) None of these

ii) $Y = \overline{A}\overline{B} + AB$ is a Boolean expression for

A) EX – OR B) EX – NAND C) EX – NOR D) None of these

iii) A+(B+C) = (A+B)+C is a _____ property

A) Associative B) Commutative C) Distributive D) None of these

iv) The expression $Y = AB + \overline{B}C + BC$ when simplified is _____

A) B + C B) AB C) $A + \overline{B}$ D) AB+C

b. Simplify the following Boolean expressions

$Y = \overline{A}\overline{B}\overline{C} + \overline{A}B\overline{C} + A\overline{B}\overline{C} + AB\overline{C}$

$Y = (A\overline{B} + \overline{A}C)(BC + B\overline{C})(ABC)$ **(06 Marks)**

c. Draw the logic circuit of a full adder and also write its truth table with sum and carry expressions. **(06 Marks)**

d. Realize the expression $F = \overline{(X + Y(\overline{Z} + \overline{Y})}$ using only NAND – Gates. **(04 Marks)**

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10ELE15/25

First/Second Semester B.E. Degree Examination, December 2011
Basic Electrical Engineering

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 only on OMR sheet page 5 of the answer booklet.***
3. ***Answer to objective type questions on sheets other than OMR will not be valued.***

PART – A

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

i) Two resistors R_1 and R_2 give combined resistance of 4.5 Ω when in series and 1 Ω when in parallel, the resistances are
A) 2 Ω and 2.5 Ω B) 1 Ω and 3.5 Ω
C) 1.5 Ω and 3 Ω D) 4 Ω and 0.5 Ω

ii) Kirchoff's voltage law applies to circuit with
A) linear elements only
B) non – linear elements only
C) linear, non-linear, active and passive elements
D) linear, non-linear, active, passive, tine varying as well as time invariant elements.

iii) Energy consumed by a heater of rating 1000W by operating it for a period of 2 hrs will be
A) 1 kWh B) 2 kWh
C) 2.5 kWh D) 4 kWh

iv) A practical voltage source is represented by
A) a resistance in parallel with an ideal voltage source
B) a resistance in series with an ideal current source
C) a resistance in series with an ideal voltage source
D) None of the above.

b. For the circuit shown in Fig.Q.1(b), find the current supplied by each battery and power dissipated in 1 Ω resistor. **(06 Marks)**

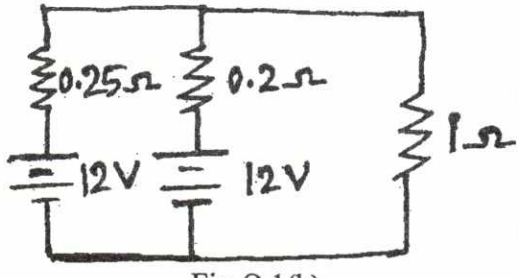

Fig.Q.1(b)

c. Explain the Fleming's rules and their use in electromagnetism. **(06 Marks)**

d. A solenoid 1m in length and 10cm in diameter has 5000 turns. Calculate the inductance and energy stored in the magnetic field when a current of 2A flows in the solenoid. **(04 Marks)**

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

i) Definition of root-mean square value is

A) Square root of area under the square curve over half cycle to length of base over half cycle

B) Average value by $\sqrt{2}$

C) Ratio of maximum value to average value

D) None of the above.

ii) The equation of an alternating current is i = 42.42 Sin 628t. The effective value will be

A) 27A B) 30A C) 2.7A D) 3A

iii) The maximum and minimum values of power factor can be

A) +1 and -1 B) +1 and -5 C) +1 and 0 D) +5 and -5

iv) By adding more resistance to an RC circuit

A) the real power increases B) the real power decreases

C) the power factor decreases D) the phase difference increases

b. Draw the phasor diagram for RL series circuit and derive the expression for real power. **(06 Marks)**

c. For the circuit shown in Fig.Q.2(c), find the values of R and C so that $v_b = 3\ v_a$ and v_b and v_a are in quadrature. **(06 Marks)**

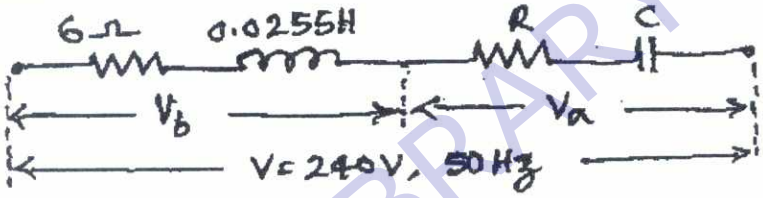

Fig.Q.2(c)

d. Two impedances $z_1 = (10 + j15)\Omega$ and $z_2 = (5 - j8)\Omega$ are connected in parallel across a voltage source. If the total current drawn is 10A, calculate currents in z_1 and z_2, and power factor of the circuit. **(04 Marks)**

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

i) The sum of the two-wattmeters readings in a 3 phase balanced system is

A) $V_{ph}\ I_{ph}\ Cos\phi$ B) $3\ V_L I_L\ Cos\phi$ C) $\sqrt{3}\ V_L I_L\ Cos\phi$ D) None of these.

ii) The rated voltage of a 3 phase system is given as

A) rms phase voltage B) peak phase voltage

C) rms line-to-line voltage D) peak line-to-line voltage

iii) A 3 phase star connected load consumes P watts of power from a 400V supply. If the same balanced load is connected in delta across that same supply, then power consumption is

A) 3 P B) $\sqrt{3}$ P C) $\frac{P}{3}$ D) P

iv) The phase sequence RBY denotes that

A) emf of phase-B lags that of phase-R by 120°

B) emf of phase-B leads that of phase-R by 120°

C) Both (A) and (B) are correct

D) None of these.

b. Derive the relationship between line and phase values of balanced star and delta connected load with balanced supply. **(08 Marks)**

c. A 3-phase delta connected load consumes a power of 60 kW taking a lagging current of 200A at a line voltage of 400V, 50Hz. Find the parameters of each phase. What would be the power consumed, if the load were connected in star? **(08 Marks)**

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

i) The moving coil in a dynamometer wattmeter is connected
   A) in series with the fixed coil B) across the supply
   C) in series with the load D) across the load

ii) The voltage coil of a single phase energy meter
   A) is highly resistive
   B) is highly inductive
   C) is highly capacitive
   D) has a phase angle equal to load p.f. angle.

iii) The meter constant of energy meter is given by
   A) rev./kW B) rev./watt C) rev./kWh D) rev./kVA

iv) The primary function of a fuse is to
   A) protect the appliance B) open the circuit
   C) prevent excessive current D) protect the line

b. Explain the principle of operation of dynamometer type wattmeter. **(06 Marks)**

c. With diagrams, explain the three-way control of a lamp. **(04 Marks)**

d. With a neat diagram, explain the plate earthing. **(06 Marks)**

PART – B

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

i) The function of a commutator in a d.c. generator is
   A) to collect current from conductors B) to change d.c. to a.c.
   C) to conduct the current to brushes D) to change a.c. to d.c.

ii) The current drawn by armature of a d.c. motor is
   A) V/Ra B) E_b/R_a C) $(V-E_b)/R_a$ D) $(E_b-V)/R_a$

iii) The speed of a series motor at no-load is
   A) zero B) 1500 rpm C) 3000 rpm D) infinity

iv) The torque of a shunt motor is proportional to
   A) armature current B) applied voltage
   C) square of the armature current D) none of these.

b. What are the functions of yoke, armature, poles and brushes in a d.c. generator? **(04 Marks)**

c. Derive the expression for armature torque developed in a d.c. motor. **(06 Marks)**

d. A 100 kW belt driven shunt generator running at 300 rpm on 220V bus-bars, continues to run as a motor when the belt breaks, then taking 10 kW. What will be its speed? Given $R_a = 0.025\ \Omega$, $R_{sh} = 60\Omega$, BCD = 1V per brush, and ARD = 0. **(06 Marks)**

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

i) The magnitude of mutual flux in a transformer is
   A) low at low loads and high at high loads
   B) high at low loads and low at high loads
   C) same at all loads
   D) varies at low loads and constant at high loads.

ii) Transformer cores are laminated in order to
   A) Simplify its construction B) minimize eddy current loss
   C) reduce cost D) reduce hysteresis loss

iii) The transformation ratio of a transformer is
   A) V_1/V_2 B) N_2/N_1 C) I_2/I_1 D) All of these

iv) A transformer is working at its maximum efficiency with iron-loss of 500W, then its copper-loss will be
   A) 500 W B) 250 W C) 300 W D) 400 W

b. Explain the construction and principle of operation of a core type transformer. **(08 Marks)**

c. A 50 kVA, 400/200 V, single phase transformer has an efficiency of 98% at full-load and 0.8 p.f., while its efficiency is 96.9% at 25% of full-load and unity p.f. Determine the iron and full load cu-losses and voltage regulation, if the terminal voltage on full-load if 195 V. **(08 Marks)**

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

i) The rotor of the synchronous generator has
   A) 4 slip rings B) 3 slip rings
   C) 2 slip rings D) No slip rings

ii) The frequency of emf generated depends on
   A) Speed B) Number of poles
   C) flux D) both (A) and (B)

iii) The distribution factor is defined as the ratio of
   A) arithmetic sum of coil emf's to phasor sum of coil emf's
   B) phasor sum of emf per coil to the arithmetic sum of coil emf's
   C) phasor sum of coil emf's to the arithmetic sum of coil emf's
   D) phasor sum of coil emf's to the per phase voltage.

iv) The salient pole type rotors are
   A) smaller in axial length
   B) larger in axial length
   C) smaller in diameter
   D) larger in diameter and smaller in axial length

b. What are the advantages of rotating field synchronous generator? **(05 Marks)**

c. List the differences between salient and non-salient type rotors. **(04 Marks)**

d. A 3-phase, 6-pole, y-connected a.c. generator revolves at 1000 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05 Wb. Calculate the generated line voltage by the machine if the winding factor is 0.96. **(07 Marks)**

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

i) The rotor of a 3 phase induction motor always runs at
   A) Synchronous speed B) Less than synchronous speed
   C) More than synchronous speed D) None of these

ii) The frequency of rotor current or emf is given by
   A) $f_2 = sf_1$ B) $f_2 = f_1/s$ C) $f_2 = (1 - s)f_1$ D) $f_2 = s/f_1$

iii) Slip of an induction motor at standstill is
   A) zero B) unity C) greater than unity D) negative

iv) If the rotor terminals of a 3 phase slip ring induction motor are not short-circuited and the supply is given to the stator, the motor will
   A) not start B) start running
   C) run at high speed D) run at low speed.

b. With diagram, explain the concept of rotating magnetic field. **(06 Marks)**

c. Why starter is necessary? What is the significance of slip in an induction motor? **(04 Marks)**

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

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Question Paper Version : B

First/Second Semester B.E Degree Examination, December 2011
Environmental Studies
(COMMON TO ALL BRANCHES)

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

INSTRUCTIONS TO THE CANDIDATES

1. Answer all FIFTY questions; each question carries ONE Mark.
2. Use only **Black ball point pen** for 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 and using whiteners** on the **OMR** sheet are strictly prohibited.

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1. Acid rain is caused by increase in the atmospheric concentration of
   a) Ozone and dust b) SO_2 and NO_2 c) SO_3 and CO d) CO_2 and CO

2. Gas leaked in Bhopal tragedy was
   a) Potassium cynate b) Sodium isothio cynate
   c) Ethyl isocynnate d) Methyl isocyannate

3. Noise pollution limits at residential area is
   a) 45 dB b) 80 dB c) 55 dB d) 90 dB

4. Lead poisoning may cause
   a) Reduction in hemoglobin b) Kidney damage
   c) Mental retardation d) All of these

5. Taj Mahal at Agra may be damaged by
   a) Sulphur dioxide b) Chlorine c) Hydrogen d) Oxygen

6. Which of the following are natural sources of air pollution?
   a) Volcanic eruption b) Solar flair c) Earth quake d) All of these

7. Environmental pollution is due to
   a)Rapid urbanization b) Deforestation c) Afforestation d) a and b

8. Ozone day is observed on
a) January 30 b) April 21 c) September 16 d) December 25

9. India's density of population according to census 2001
a) 350 per sq.km b) 375 per sq.km c) 324 per sq.km d) 425 per sq.km

10. Green house effect is related to
a) Green trees on house b) Global worming
c) Grass lands d) Greenery in country

11. Hevy duty diesel vehicles mainly contribute
a) NO_x b) SO_2 c) Particulate d) Both a and b

12. Use of compressed natural gas (CNG) came in to effect from
a) December 2002 b) January 2002 c) December 2003 d) September 2003

13. Increase in asthma attacks has been linked to high levels of
a) Nitrogen b) Oxygen c) Air–borne dust particles d) All of these

14. Urbanization is
a) Local environmental issue b) National environmental issue
c) Both a and b d) Not at all an issue

15. The number of babies produced per thousand individuals is called
a) Natality b) Dermography c) Fertility rate d) Emigration

16. ELISA test is used to detect
a) Malaria b) AIDS c) Cholera d) Tuberculosis

17. ICDS is a welfare scheme for
a) Public b) Women c) Men d) Children

18. Karnataka state "pollution control board" was established is the year
a) 1974 b) 1982 c) 1986 d) 1976

19. Environmental protection Act 1986 deals with
a) Air b) Water c) Land d) All of these

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

21. The study of interactions between living organisms and environment is called as
a) Ecosystem b) Ecology c) Phytosociology d) Biology

22. The environment which has been modified by human activities is called
a) Natural environment b) Anthropogenic environment
c) Urban environment d) Modern environment

23. Cauvery water dispute is between
a) India and Pakistan b) Punjab and Haryana
c) Uttar Pradesh and Madhya Pradesh d) Karnataka and Tamil Nadu.

24. Terrace forming is practiced in
a) Coastal areas b) Hills c) Deserts d) Plains

25. Millennium development Goal's conference of united nations was held in the year
a) 2002 b) 2000 c) 2005 d) None

26. Economic security is measured on the basis of
a) Labour markets and employment b) Income
c) Work, jobs and skills d) All of these

27. "Remote sensing" is a
a) Satellite system b) Ground segments c) Sensor system d) All of these

28. Green revolution crop verities yield increases depend on the use of
a) Inorganic fertilizers b) Pesticides
c) Energy d) All of these

29. Building materials cause environmental problems such as
a) Resource consumption b) Water and air pollution
c) Habitat loss d) All of these

30. Discharge of industrial waste water causes
a) Depletion of dissolved oxygen b) Destroy aquatic life
c) Impair biological activity d) All of these

31. Gold occurs in
a) Sedimentary deposits b) Placer deposits
c) Hydrothermal deposits d) None of these

32. EIA is used to
a) Establishing the environmental base line data b) Impact identification on
c) Both a and b d) To identify alternate industries

33. Sustainable use is applicable to
a) Renewable resources b) Non renewable resources
c) Physical growth d) None of these

34. Fluorosis is caused due to
a) No fluoride intake b) Low fluoride intake
c) Excessive fluoride intake d) None of these

35. Both power and manure is provided by
a) Nuclear plants b) Thermal plants
c) Biogas plants d) Hydroelectric plant

36. Percentage of freshwater available on the earth is
a) 2.8% b) 2.2% c) 0.6% d) 2.15%

37. Surface water potential of Karnataka state is around
a) 20 M.ha–m b) 18 M.ha–m c) 17 M.ha–m d) 28 M.ha–m

38. Ore is a
a) Metallic element b) Non-metallic element
c) Plastic materials d) Both a and b.

39. Forest is
a) Simple ecosystem b) Complex ecosystem
c) Group of trees d) None of these

40. Earth atmosphere contains _____% nitrogen
a) 98% b) 12% c) 21% d) 78%

41. Sulphur – di – oxide is used in
a) Paper manufacture b) Textile manufacture
c) Processing of fossil fuels d) Both a and b

42. EMR propagate energy with a velocity of
a) $3x10^6$ m/se b) $3x10^8$ m/sec c) $0.3x10^8$ m/se d) $30x10^4$ m/sec

43. Solar photo voltaic system are more suitable for
a) Domestic lighting b) Street lighting c) Small power plants d) All of these

44. The first nuclear fission reactor in the world become critical in
a) June 1972 b) July 1974 c) December 1942 d) None of these

45. Green house gases are
a) Chlorofluro carbon b) Oxygen
c) Chlorine d) Chloro benzene.

46. Fossil fuel is also known as
a) Lubricating fuel b) Liquid fuel c) Solid fuel d) Mineral fuel

47. Biogas is an excellent fuel when its methane content is about
a) 15% b) 65% c) 0% d) 6.5%

48. Coal mining leads to adverse environmental effect like
a) Aesthetic degradation
b) Release of trace elements into water soil and air.
c) Dust pollution
d) All of these

49. "Agro forestry" environmental benefits
a) Recycling of nutrients
b) Reduction of surface run-off nutrient leaching and soil erosion.
c) Ecosystem protection
d) All of these

50. Geothermal energy is a
a) Heat energy b) Current energy c) wind energy d) Solar energy

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Question Paper Version : A

I / II Semester B.E Degree, Examination, December 2011
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS
(COMMON TO ALL BRANCHES)

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

INSTRUCTIONS TO THE CANDIDATES

1. Answer all FIFTY questions; each question carries ONE Mark.
2. Use only **Black ball point pen** for 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.**
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5. **Damaging/overwriting and using whiteners** on the **OMR** sheet are strictly prohibited.

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1. The constitution of India derives its authority from the :
   a) Parliament b) Supreme court c) People of India d) constituent assembly.
2. The preamble was amended by :
   a) 24th amendment b) 42nd amendment c) 39th amendment d) none.
3. The date of commencement of Indian constitution is :
   a) 26th Nov 1949 b) 26th Nov 1945 c) 15th Aug 1947 d) 26th Jan1950
4. Fraternity means :
   a) Spirit of brotherhood b) Fatherly treatment
   c) Unity and integrity of the nation d) Elimination of economic justice
5. Gandhiji's call to all Indians 'Do and Die', is popularly known as
   a) Quit India movement b) Garibi hataoh
   c) Independence movement d) Salt satyagraha.
6. Universal adult franchise shows that India is a country which is
   a) Secular b) Socialist c) Democratic d) Sovereign.
7. The directive principles incorporated in the Indian constitution have been inspired by the constitution of
   a) Ireland b) USA c) Australia d) Canada

8. Upto what age children are required to be provided compulsory education under directive principles?
   a) 18 years b) 15 years c) 14 years d) 16 years.

9. Who said the directive principles of state policy are the "Novel feature of the Indian constitution"?
   a) Motilal Nehru b) B. R. Ambedkar c) Jawajarlal Nehru d) None.

10. Fundamental duties are borrowed from the constitution of
    a) Russia b) America c) Ireland d) Australia

11. Fundamental duties were incorporated in the constitution to
    a) Curb subversive and unconstitutional activities
    b) Prevent misuse of fundamental rights
    c) Curb the growing power of execution
    d) Make the fundamental rights more meaningful.

12. The executive power of the union government is vested in
    a) The prime minister b) The president c) The council ministers d) None.

13. The vacancy in the offices of the president must be filled with in
    a) 3 months b) 1 year c) 5 years d) 6 months.

14. The minimum age for appointment of prime minister is
    a) 25 years b) 21 years c) 18 years d) 30 years

15. Supreme court judge hold office until the age of
    a) 65 years b) 62 years c) 70 years d) No age limit

16. Who chooses the speaker?
    a) President b) Lok Sabha
    c) Prime minister d) Opposition in Lok Sabha

17. This is not a writ
    a) Writ of Habeas corpus b) Writ of mandamus
    c) Writ of levitorari d) Writ of presentation

18. The election of the president is by a system of proportional representation by means of
    a) Valid transferable vote b) Transferable vote
    c) Single transferable vote d) Legally transferable vote

19. How many types of writs are there?
    a) Seven b) Three c) Six d) Five

20. Respite means
    a) Death due to strangulation b) Death due to drowning
    c) Awarding lesser punishment d) Painless death.

21. Ambassadors are appointed by
    a) Prime minister b) Minister for external affairs
    c) Home minister d) President

22. The seat of supreme court is
    a) Mumbai b) Chennai c) Bangalore d) New Delhi

23. Which of the following is called as fourth estate?
a) Assembly b) Parliament c) Press d) Lok Sabha

24. Which budget is placed first in the parliament house?
a) Railway b) General budget c) Financial d) Vote of credit

25. The ground for impeachment of president is
a) Violation of the constitution
b) Misbehavior with foreign dignitaries
c) Unable to discharge duty due to ill health
d) None of these

26. Who has the power to pardon in case of capital punishment?
a) Prime minister
b) Chief justice
c) President
d) Attorney General of India

27. Who acts as the channel of communication between the president and the council of ministers
a) Prime minister
b) Deputy prime minister
c) Speaker of L.S
d) Senior most minister.

28. Governor addresses his resignation to
a) The prime minister
b) The president
c) Vice president
d) Chief minister

29. Governor is responsible to
a) President
b) Prime minister
c) Chief minister
d) Council of minister

30. The minimum age to contest for the election of legislative assembly is
a) 30 b) 21 c) 35 d) 25

31. The chief minister is appointed by
a) Prime minister b) Governor c) President d) Vice President

32. What is the system of legislature in the state of Karnataka?
a) Bicameral b) Unicameral c) Cameral d) None

33. How many states in India have legislative councils?
a) 5 b) 4 c) 6 d) 7

34. Who is described as the custodian of state legislative assembly?
a) Chief minister b) Speaker c) Leader of apposition d) Deputy C.M.

35. This is not a ground to declare national emergency
a) War
b) Serious internal disturbance
c) Armed rebellion
d) External aggression.

36. In which year was "untouchability" abolished in India?
a) 1950 b) 1954 c) 1947 d) 1976

37. Who appoints the election commission?
a) Prime minister b) Parliament c) President d) None of these

38. Amend means
a) Remove the difficulties
b) Making the meaning more clear
c) Make the object of the act more clear
d) Omit

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

40. Cooking means
a) boiling under pressure
b) Retaining results which fit theory
c) Making deceptive statements
d) Misleading the public about quality of the product

41. One of the characteristic of profession is
a) Monopoly b) Hard work c) Honesty d) Competition

42. The term ethics is derived from
a) Ethical in English b) Ethic in Latin c) Ethicos in Greek d) French

43. Intellectual property is protected by
a) Patents, trade marks and copy rights
b) Company documentation
c) Storage in computers
d) Scrutiny personal

44. Engineers' first obligation is towards
a) His employer b) Public safety c) Government d) Clients

45. The owner of the patent right retains his patent for
a) 100 years b) 50 years c) 75 years d) 20 years

46. Which one is not a trade secret?
a) Theorem b) Equipment c) Formulae d) Pattern

47. The codes of Ethics can be taken as guidelines by the engineers to
a) resolve the conflicts
b) Formulate problems
c) Over come the work pressure
d) Escape from the responsibility

48. A fault tree is used to
a) assess the risk involved
b) Claim compensation
c) Take free consent
d) Improve safely.

49. Engineers will serve society better, if they are informed about
a) Morality
b) Technical standards
c) Standards of science
d) Litigation processes.

50. Reliability is built through
a) Engineer's tack record
b) Engineer's goodness
c) Engineer's communication skill
d) Engineer's obedient conduct.

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