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06MAT11

First Semester B.E. Degree Examination, December 2010
Engineering Mathematics - I

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, selecting at least TWO questions from each part.**2. Answer all objective questions only in OMR sheet of the answer booklet.****3. Answer to the objective type questions on sheet other than OMR sheet will not be valued.****PART - A**

1 a. Choose the right answer :

i) The n^{th} derivative of $\log(ax + b)$ is

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

ii) The angle between the radius vector and the tangent for the curve $r = a$ is

A) π B) $\frac{\pi}{2}$ C) $\frac{\pi}{4}$ D) ZERO

iii) $\frac{d^{2n}(x^2-1)^n}{dx^{2n}}$ is

A) $2(n!)$ B) $2nx^{2n-1}$ C) $(2n)!$ D) $2nx^{2n-2}$

iv) If A (p, r) is a point on a curve in pedal equation, then p refers to,

A) $\sqrt{x^2 + y^2}$

B) $\sqrt{1 + \left(\frac{dy}{dx}\right)^2}$

C) Perpendicular distance between the point A and the tangent to the curve at A.

D) Perpendicular distance between the origin and the tangent to the curve at point A.

(04 Marks)

b. Find the n^{th} derivative of $y = \sin(2x+3) + e^{3x} + (5x-3)^{10} + \frac{1}{4x+5}$. (04 Marks)c. If $y = \sin \log(x^3 + 3x^2 + 3x + 1)$, show that $(x+1)^2 y_{n+2} + (2n+1)(x+1)y_{n+1} + (n^2+9)y_n = 0$ (06 Marks)d. Find the angle between the curves $r = a \sec^3\left(\frac{\theta}{3}\right)$ and $r = b \operatorname{cosec}^3\left(\frac{\theta}{3}\right)$. (06 Marks)

2 a. Choose the right answer :

i) If $u = \sin(x+ay) + \cos(x-ay)$ implies $u_{yy} = a^2 u_{xx}$ then $u = f(x+y) + g(x-y)$ implies

A) $u_{yy} + u_{xx} = 0$ B) $xu_x + yu_y = u$ C) $xu_x + yu_y = -u$ D) $u_{yy} = u_{xx}$

ii) If $u = \sin\left(\frac{y}{x}\right) + \tan\left(\frac{x}{y}\right)$ then u is homogeneous function of order,

A) -1 B) 1 C) ZERO D) None of these

iii) If $J\left(\frac{u,v}{x,y}\right) \neq 0$ then

A) Only x, y are independent B) x, y are independent and u, v are independent
 C) Only u, v are independent D) Cannot predict

iv) If 20% error is made in each of the independent variables then the percentage error in w, if $w = xyzuv$ is

A) 100% B) 20% C) $(20)^5\%$ D) 5% (04 Marks)

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- b. A balloon is in the form of the right circular cylinder of radius 1.5 cms and length 4 cms and is surmounted by hemispherical ends. If the radius is increased by 0.01 cms and the length is increased by 0.05 cms, find the percentage change in the volume of the balloon. (04 Marks)
- c. If $u = (x^2 + y^2 + z^2)^{-1/2}$ then find i) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z}$; ii) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2}$. (06 Marks)
- d. i) If $u = x^2 - y^2$, $v = 2xy$, find $J\left(\frac{u, v}{x, y}\right)$; ii) If $x^2 + xy + y^3 = 2$, find $\frac{d[x^3 y]}{dx}$. (06 Marks)

3 a. Choose the right answer :

- i) The value of $\int_0^{\pi/2} \cos^3\left(\frac{\theta}{2}\right) d\theta$ is
- A) $\frac{4}{3}$ B) $\frac{2}{3}$ C) $\frac{2}{3}\pi$ D) $\frac{4}{3}\pi$
- ii) The curve $x^{2/5} + y^{2/7} = a$ is symmetric
- A) Only about x - axis B) About both x and y axes
C) Only about y - axis D) About the line $y = x$
- iii) If $I_1 = \int_0^{\pi/4} \tan^6 x dx$ and $I_2 = \int_{\pi/4}^{\pi/2} \cot^6 x dx$ then
- A) $I_1 = I_2 + \pi/4$ B) $I_1 = I_2 - \pi/4$ C) $I_1 = I_2$ D) $I_1 = 2I_2$
- iv) The reduction formula of $\int \sec^n x dx$ is
- A) $\frac{\tan x \sec^{n-1} x}{n-1} + \frac{n-2}{n-1} I_{n-2}$ B) $\frac{\tan x \sec^{n-2} x}{n-1} + \frac{n-1}{n-2} I_{n-2}$
C) $\frac{\tan x \sec^{n-2} x}{n-2} + \frac{n-1}{n-2} I_{n-2}$ D) $\frac{\tan x \sec^{n-2} x}{n-1} + \frac{n-2}{n-1} I_{n-2}$ (04 Marks)

b. Obtain the reduction formula for $\int \sin^n x dx$. (04 Marks)

c. Evaluate $\int_0^{\infty} \frac{x^6}{(1+x^2)^7} dx$. (06 Marks)

d. Trace the curve $3ax^2 = y(y-a)^2$. (06 Marks)

4 a. Choose the right answer :

- i) The perimeter of the curve $r = a$ is
- A) $4a$ B) πa C) $2a$ D) $2\pi a$
- ii) If v_1 and v_2 are volumes of the solids of revolution got by rotating respectively, 'the parabola $y^2 = 4ax$, above x -axis, between $x = 0$ to $x = 2a$ ' and 'the same parabola $y^2 = 4ax$ both above and below x - axis between $x = 0$ to $x = 2a$ ' then
- A) $v_2 = 2v_1$ B) $v_2 = 4v_1$ C) $v_2 = v_1$ D) None of these
- iii) If the axis of the revolution is the y - axis then the surface area of revolution is
- A) $\int_{x_1}^{x_2} 2\pi y ds$ B) $\int_{y_1}^{y_2} 2\pi x ds$ C) $\int_{y_1}^{y_2} 2\pi \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dy$ D) $\int_{x_1}^{x_2} 2\pi \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dx$
- iv) The area bounded by the curve in polar form is
- A) $\int_{\theta_1}^{\theta_2} \frac{1}{2} r^2 d\theta$ B) $\int_{r_1}^{r_2} \frac{1}{2} \theta^2 dr$ C) $\int_{\theta_1}^{\theta_2} \sqrt{1 + \left(\frac{dr}{d\theta}\right)^2} d\theta$ D) $\int_{x_1}^{x_2} y dx$ (04 Marks)

b. Compute the total arc - length (perimetre) of the cardioid $r = 2(1 + \cos\theta)$. (04 Marks)

c. Find the area enclosed between the cycloid $x = a(t - \sin t)$, $y = a(1 - \cos t)$ and its base. (06 Marks)

d. Find the volume of the solid generated by revolving the astroid $x^{2/3} + y^{2/3} = a^{2/3}$ about the x - axis. (06 Marks)

PART - B

5 a. Choose the right answer :

- i) The order of the differential equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 8y = 0$ is :
 A) 2 B) ZERO C) 1 D) 3
- ii) The integrating factor of $\frac{dy}{dx} + P(x)y = Q(x)$ is
 A) Only function of y B) Only function of x
 C) Function of x and y D) Function of dy/dx
- iii) The differential equation $\frac{dy}{dx} + \frac{y}{x} = 0$ can be solved
 A) Only by variable separable, or exact method
 B) Only by homogeneous or linear d.c. method
 C) By all the methods mentioned in (A) and (B)
 D) Only by variable separable method.
- iv) The differential equation $(x - 2)dy = (2 - y)dx$ is
 A) Only R.H.S. exact B) Only L.H.S. exact
 C) Not exact D) Exact d.e. (04 Marks)

b. Solve $\text{Cosy} \frac{dy}{dx} - \text{Siny} \frac{1}{1+x} = (x+1)^2$. (04 Marks)

c. Solve $(y^2 e^{xy^2} + 4x^3)dx + (2xy e^{xy^2} - 3y^2)dy = 0$. (06 Marks)

d. Find the orthogonal trajectory of $r = a(1 + \text{Cos } \theta)$. (06 Marks)

6 a. Choose the right answer :

- i) For a series of positive terms $\sum_{n=1}^{\infty} u_n$ if $\lim_{n \rightarrow \infty} u_n$ does not tend to zero then the series is,
 A) Convergent B) Cannot conclude C) Oscillatory D) Divergent
- ii) If positive term series $\sum_{n=1}^{\infty} u_n$, $\sum_{n=1}^{\infty} v_n$ both are divergent then $\sum_{n=1}^{\infty} u_n - \sum_{n=1}^{\infty} v_n$ is
 A) Divergent B) Convergent C) Cannot predict D) Oscillatory
- iii) The series $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$ is
 A) Divergent B) Convergent C) Oscillatory D) None of these
- iv) If an infinite series $\sum u_n$ is convergent and if $\lim_{n \rightarrow \infty} \frac{u_n}{u_{n+1}} = k_1$, $\lim_{n \rightarrow \infty} \frac{u_{n+1}}{u_{n+2}} = k_2$ then,
 A) $k_1 = k_2$ B) $k_1 \neq k_2$ C) $k_1 < k_2$ D) $k_1 > k_2$ (04 Marks)

b. Test the convergence of $\frac{9}{6.7.8} + \frac{11}{11.12.13} + \frac{13}{16.17.18} + \frac{15}{21.22.23} + \dots$ (04 Marks)

c. Test the convergence of $1 + 2 + 3 + 4 + 5 + \frac{3^2}{4^2}x + \frac{3^2 \cdot 4^2}{4^2 \cdot 5^2}x^2 + \frac{3^2 \cdot 4^2 \cdot 5^2}{4^2 \cdot 5^2 \cdot 6^2}x^3 + \dots$ (06 Marks)

d. i) Using Leibnitz's test, detect the nature of the series, $\frac{2}{3} - \frac{3}{4} + \frac{4}{5} - \frac{5}{6} + \dots$

ii) Define conditional convergence and give one example. (06 Marks)

7 a. Choose the right answer :

i) The line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-5}{11}$ and the plane $5x + 4y - 2z = 8$,

- A) Intersect at an angle $\pi/4$ B) Intersect at an angle $\pi/6$
 C) Are perpendicular D) Are parallel

ii) The direction cosines of x, y, z axes are respectively

- A) $(-1, 1, 1)$ $(1, -1, 1)$ $(1, 1, -1)$ B) $\left(\frac{1}{\sqrt{2}}, 0, 0\right)$ $\left(0, \frac{1}{\sqrt{2}}, 0\right)$ $\left(0, 0, \frac{1}{\sqrt{2}}\right)$
 C) $(1, 0, 0)$ $(0, 1, 0)$ $(0, 0, 1)$ D) $(1, -1, -1)$ $(-1, 1, -1)$ $(-1, -1, 1)$

iii) A point on a line $\frac{x}{2} = \frac{y+3}{6} = \frac{z-1}{10}$ is

- A) $(-1, 0, 6)$ B) $(1, 0, 6)$ C) $(-1, 0, -6)$ D) $(1, 0, -6)$

iv) A line perpendicular to plane is

- A) Perpendicular to all the lines in the plane
 B) Perpendicular to one set of parallel lines in the plane
 C) Perpendicular to exactly one line in the plane
 D) A line can not be perpendicular to the plane

(04 Marks)

b. Find the angle between the lines AB and CD, where :

$A = (1, 2, 3)$, $B = (4, 5, 9)$, $C = (2, 4, 6)$, $D = (5, 7, 8)$.

(04 Marks)

c. Show that the points $(1, 1, 1)$ $(2, -3, 11)$ $(4, -2, 4)$ $(1, 0, 4)$ are co-planar. Find the equation of the plane passing through the given points.

(06 Marks)

d. Find the shortest distance between the straight lines

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$$

$$\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$$

(06 Marks)

8 a. Choose the right answer :

i) If $\vec{r} = \vec{op}$ with $p = (x, y, z)$, $0 = (0, 0, 0)$, $x = t^2$, $y = 2t - 3$, $z = 3t - 5$ then \vec{r} at $t = 1$

is

- A) $i - j - 2k$ B) $i + 2j + 3k$ C) $i + j + k$ D) $i - j + 2k$

ii) Recognize the meaningless expression, for \vec{F} = vector function and ϕ = scalar function

- A) $\text{grad}(\text{div } \vec{F})$ B) $\text{grad}(\text{grad } \phi)$ C) $\text{curl}(\text{grad } \vec{F})$ D) $\text{div}(\text{grad } \phi)$

iii) $\text{Curl}(\text{curl } \vec{F})$ is

- A) $\text{grad}(\text{div } \vec{F})$ B) $\nabla^2 F$ C) $\text{grad}(\text{div } \vec{F}) - \nabla^2 F$ D) $(\text{curl})^2 \vec{F}$

iv) If \vec{F} is a vector point function, recognize the true statement :

- A) $\nabla \times \vec{F} = -\vec{F} \times \nabla$ B) $\nabla \cdot \vec{F} = \vec{F} \cdot \nabla$ C) $\nabla \cdot \nabla \vec{F} = \nabla \times \nabla \vec{F}$ D) $\nabla \cdot \vec{F} \neq \vec{F} \cdot \nabla$

(04 Marks)

b. Find the angle between the normals to the surface $xy = z^2$ at the points $(4, 1, 2)$ and $(3, 3, -3)$.

(04 Marks)

c. i) For what value of 'a', vector point function \vec{F} is solenoidal

if $\vec{F} = (2x + 3y) i - (3x + 4y) j + (y - az) k$

ii) Is $\vec{F} = (6xy + z^3) i + (3x^2 - z) j + (3xz^2 - y) k$, irrotational?

(06 Marks)

d. If \vec{F} and ϕ are vector and scalar point functions respectively then prove that

$$\text{div}(\phi \vec{F}) = \phi(\text{div } \vec{F}) + (\text{grad } \phi) \cdot \vec{F}.$$

(06 Marks)

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06MAT21

Second Semester B.E. Degree Examination, December 2010
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 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 in each of the following :

i) The radius of curvature of a curve $y = c \cosh(x/c)$ is

- A) $\frac{c^2}{2}$ B) $\frac{y^2}{c}$ C) $\frac{3c}{8\sqrt{2}}$ D) c

ii) The value of C of the Rolle's theorem for $f(x) = \frac{\sin 2x}{e^{2x}}$ in $[0, \pi/2]$ is

- A) 3π B) $\pi/8$ C) π D) $= \pi/5$

iii) Maclaurins series expansion of $e^{\sin x}$ is

- A) $1 + x + \frac{x^2}{2} - \frac{x^4}{8} + \dots$ B) $x - \frac{x^3}{3!} + \frac{x^5}{5!} + \dots$

- C) $x + \frac{x^3}{3!} + \frac{x^5}{5!} + \dots$ D) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} + \dots$

iv) The value of C of the Lagrange's mean value theorem for $f(x) = \log x$ in $[1, e]$ is

- A) 1.2 B) 2.5 C) 1.7 D) 3.2 (04 Marks)

b. Find the radius of curvature for the curve, $x^3 + y^3 = 3axy$ at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on it.

(04 Marks)

c. State and prove Lagrange's mean value theorem.

(06 Marks)

d. Expand $\log(\sec x)$ up to the term x^4 using Maclaurin's series.

(06 Marks)

2 a. Select the correct answer in each of the following :

i) $\lim_{x \rightarrow \pi/2} \frac{\log(\sin x)}{(\pi/2 - x)^2}$ equals

- A) $\frac{1}{2}$ B) 2 C) $\pi/2$ D) $-1/2$

ii) For finding extreme values of $f(x, y)$,

- A) $\frac{\partial f}{\partial x} = 0, \frac{\partial f}{\partial y} = 0$ B) $\frac{\partial^2 f}{\partial y \partial x} = 0$

- C) $\frac{\partial^2 f}{\partial y^2} = 0$ D) None of these

iii) The rectangular box of maximum volume and a given surface area is

- A) a triangle B) a rectangle C) a cube D) None of these

iv) For finding the stationary value of $u(x, y, z)$ subject to the condition $\phi(x, y, z) = c$, the relation is

- A) $F = u(x, y, z) + \lambda \phi(x, y, z) = c$ B) $F(x, y) = 0$

- C) $\frac{\partial f}{\partial x} = 0$ D) None of these (04 Marks)

- b. Evaluate $\lim_{x \rightarrow 0} \tan x \log x$. (04 Marks)
- c. Expand $\sin(xy)$ about $(1, \pi/2)$ up to second degree terms. (06 Marks)
- d. Find the extreme values of the function, $f(x, y) = x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$. (06 Marks)
- 3 a. Select the correct answer in each of the following :
- i) $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dy dx =$
 A) $2/5$ B) $3/35$ C) $3/2$ D) $5/2$
- ii) $\int_{-c}^c \int_{-b}^b \int_{-a}^a (x^2 + y^2 + z^2) dz dy dx =$
 A) $8abc(a^2 + b^2 + c^2)/3$ B) $\frac{8abc}{3}$
 C) $9ab^2c$ D) $\frac{a^2bc^2}{3}$
- iii) The value of $\beta(m, n)$ is
 A) $\int_0^1 x^{m-1}(1-x)^{n-1} dx$ B) $\int_0^\infty e^{-x} x^{n-1} dx$
 C) $\int_1^\infty e^{x^2+y^2} dx$ D) None of these
- iv) The value of $\sqrt{(1/2)}$ is
 A) $\sqrt{\pi}$ B) π C) $\pi^2/2$ D) $\pi/\sqrt{2}$. (04 Marks)
- b. Evaluate $\int \int xy(x+y) dy dx$ taken over the area between $y = x^2$ and $y = x$. (04 Marks)
- c. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$. (06 Marks)
- d. Prove that $\beta(m, n) = \beta(n, m)$. (06 Marks)
- 4 a. Select the correct answer in each of the following :
- i) \vec{F} is said to be irrotational, if
 A) $\oint_c \vec{F} \cdot d\vec{r} = 0$ B) $\vec{F} d\vec{r} = 0$ C) $\vec{F} \cdot \vec{r} = 0$ D) None of these
- ii) If \vec{F} is the force acting upon a particle in displacing it along the curve c to the other end, then the total work done by \vec{F} is,
 A) $\int \vec{F} \cdot x d\vec{r}$ B) $\int \vec{F} \cdot d\vec{r}$ C) $\int d\vec{r}$ D) None of these
- iii) Green's theorem in the plane is a special case of
 A) Gauss theorem B) Euler's theorem
 C) Stokes theorem D) Baye's theorem
- iv) The cylindrical polar co-ordinates are (ρ, ϕ, z) given by
 A) $x = \rho \cos\phi, y = \rho \sin\phi, z = z$ B) x, y, z
 C) $x = \sin\theta, y = \cos\theta$ D) None of these (04 Marks)

- b. If $\vec{F} = (3x^2 + 6y) \mathbf{i} - 14yz \mathbf{j} + 20xz^2 \mathbf{k}$, evaluate $\int \vec{F} \cdot d\vec{r}$ from $(0, 0, 0)$ to $(1, 1, 1)$ along the curve given by $x = t, y = t^2, z = t^3$. (04 Marks)
- c. Verify Stokes theorem for $\vec{F} = (2x - y) \mathbf{i} - yz^2 \mathbf{j} - y^2z \mathbf{k}$, where S is the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$, C is its boundary. (06 Marks)
- d. If $\phi = xyz$, find $\nabla^2 \phi$ in the cylindrical system. (06 Marks)

PART - B

- 5 a. Select the correct answer in each of the following :
- i) P.I. of the differential equation $(D^2 + 4D + 4)y = e^{-2x}$ is
 A) e^x B) $\frac{x^2 e^{-2x}}{2}$ C) x^3 D) $\frac{x e^{2x}}{3}$
- ii) The solution of the differential equation $(D^2 + 2D + 1)y = 0$ is
 A) $c_1 e^x + c_2 e^{-x}$ B) $(c_1 + c_2 x) e^{-x}$
 C) $c_1 e^x$ D) $c_1 + c_2 e^{-2x}$
- iii) The roots of the A. E. with differential equation $(D^3 - D^2 + 4D - 4)y = 0$ are
 A) $1, \pm 2i$ B) $1, 2, 1$ C) $1, 3, 2$ D) $2, 2, 2$
- iv) The particular solution of the differential equation $f(D)y = e^{ax}$ is
 A) $\frac{e^{ax}}{f(a)}$ B) $\frac{e^{ax}}{f(D+a)}$
 C) $\frac{e^{ax}}{f(-a)^2}$ D) None of these (04 Marks)
- b. Solve $6 \frac{d^2 y}{dx^2} + 17 \frac{dy}{dx} + 12y = e^{-x}$. (04 Marks)
- c. Solve the equation $(D^3 - 1)y = 3 \cos 2x$. (06 Marks)
- d. Solve by the method of undetermined coefficients $(D^2 - 4D + 4)y = e^x$. (06 Marks)
- 6 a. Select the correct answer in each of the following :
- i) The Wronskian of differential equation $f(D)y = \phi(x)$ is
 A) $W = y_1 y_2' - y_2 y_1'$ B) $W = y_2 y_1$
 C) $W = y_2^2$ D) $y_1 + y_2$
- ii) To transform $(ax + b)^2 y'' + (ax + b)y' + y = \phi(x)$ into a linear differential equation with constant coefficients put $t =$
 A) $\log(ax + b)$ B) e^x C) x D) e^{2x}
- iii) The solution of the differential equation $y'' + 4y' + 4y = 0$, satisfying the conditions $y(0) = 1$ and $y(1) = 1$ is
 A) $(c_1 + c_2 x)^{-2x}$ B) $\cos x + \sin x$ C) $2 \sin x$ D) $\sin x \cos x$
- iv) $c_1 e^x + c_2 e^{-x}$ is the general solution of
 A) $(D^2 + 1)y = 0$ B) $(D^2 - 1)y = 0$ C) $(D + 1)y = 0$ D) None of these (04 Marks)
- b. Solve $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + 4y = (1 + x)^2$. (04 Marks)
- c. Solve by the method of variation of parameters $(D^2 + a^2)y = \sec ax$. (06 Marks)
- d. Solve the initial value problem $\frac{d^2 x}{dt^2} + 5 \frac{dx}{dt} + 6x = 0$ given that $x(0) = 0, \frac{dx}{dt}(0) = 15$. (06 Marks)

- 7 a. Select the correct answer in each of the following :
- Laplace transform of $\cos at$ is
 - $\frac{s}{s^2 + a^2}$
 - $\frac{a}{s^2 - a^2}$
 - $\frac{1}{s^2 + a^2}$
 - $\frac{1}{s - a}$
 - Laplace transform of $\sin at$ is
 - $\frac{a}{s^2 + a^2}$
 - $\frac{a}{s^2 - a^2}$
 - $\frac{s}{s^2 + a^2}$
 - $\frac{1}{s^2 + a^2}$
 - Laplace transform of $[e^{at} f(t)]$ is
 - $\bar{f}(s+a)$
 - $\bar{f}(s-a)$
 - $\bar{f}(s)$
 - None of these
 - Laplace transform of (t^5) is equal to
 - $\frac{120}{s^6}$
 - $\frac{10}{s^3}$
 - $\frac{125}{s^6}$
 - $\frac{122}{s^4}$. (04 Marks)
- b. Find the Laplace transform of $e^{3t} \sin 5t \cos 3t$. (04 Marks)
- c. Given $f(t) = \begin{cases} E, & 0 < t < a/2 \\ -E, & a/2 < t < a \end{cases}$, where $f(t+a) = f(t)$, show that $L\{f(t)\} = \frac{E}{s} \tanh\left(\frac{as}{4}\right)$. (06 Marks)
- d. Find the Laplace transform of the function $[e^{t-1} + \sin(t-1)] u(t-1)$. (06 Marks)
- 8 a. Select the correct answer in each of the following :
- Inverse Laplace transform of $\frac{1}{s+1}$ is
 - e^{at}
 - e^{-t}
 - e^{2t}
 - t
 - Inverse Laplace transform of $\frac{s+5}{s^2-6s+13}$ is
 - $e^{3t} (\cos 2t + 4 \sin 2t)$
 - $\cos 2t$
 - e^t
 - None of these
 - Inverse Laplace transform of $\frac{1}{s^4}$ is
 - $\frac{t^2}{2!}$
 - $\frac{t^3}{3!}$
 - $\frac{t^4}{4!}$
 - $\frac{t^2}{4!}$
 - $L^{-1}\left(\frac{1}{s^2+5}\right) =$
 - $\frac{1}{\sqrt{5}} \sin(\sqrt{5}t)$
 - $\frac{1}{\sqrt{6}} \cos \sqrt{6}t$
 - $\frac{1}{\sqrt{7}} \sin \sqrt{6}t$
 - None of these. (04 Marks)
- b. Find the inverse Laplace transform of $\frac{s^2 - 2s^2 + 1}{s^5}$. (04 Marks)
- c. Find the inverse Laplace transform of $\frac{1}{s(s+1)(s+2)(s+3)}$. (06 Marks)
- d. Solve by using Laplace transforms $\frac{d^2y}{dt^2} + k^2y = 0$ given that $y(0) = 2, y'(0) = 0$. (06 Marks)

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06CHE12/22

First/Second Semester B.E. Degree Examination, December 2010
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.** Select the correct answer:
- The tendency of knocking is more in hydrocarbons.
 A) Aromatic B) Straight chain C) Olefins D) Cyclic
 - Catalyst used in fluidized-bed catalytic cracking is
 A) $ZrO_2 + CeO_2$ B) $Al_2O_3 + Fe_2O_3$
 C) Fluidized Al_2O_3 and SiO_2 D) $Al_2O_3 + CeO_2$
 - Petrol obtained from petroleum oil is subjected to reforming because
 A) To remove impurities and water B) For structural modification
 C) For degradation of high mol. weight hydrocarbons D) To reduce weight.
 - junction is used in the conversion of solar energy into electrical energy.
 A) p - n - p B) n - p - n C) p - n D) none of these. (04 Marks)
- b.** Define net and gross calorific value of a fuel. Describe how calorific value of a solid sample is determined. (07 Marks)
- c.** Explain the terms 'octane' and 'cetane' numbers. (05 Marks)
- d.** Calculate the gross calorific of a sample of coke from the following data:
 Mass of coke: 0.73×10^{-3} kg Water equivalent of the calorimeter: 0.328 kg
 Mass of water: 1.25 kg Specific heat of water: $4.187 \text{ kJ kg}^{-1} \text{K}^{-1}$
 Rise in temperature: 1.9 K. (04 Marks)
- 2 a.** Select the correct answer:
- Glass electrode can not be used in the presence of fluoride ions because
 A) alkaline error B) loss its activity
 C) glass membrane dissolves D) leads to asymmetric potential.
 - The value of EMF is, if $\Delta G = -212.3 \text{ kJ/mol}$, $T = 298 \text{ K}$ and Faraday constant = 9.65 kJ/V/mol .
 A) 11.0 V B) 1.1 V C) 2.2 V D) 22.0 V
 - EMF of a cell mainly depends on
 A) Size of the cell B) Quantity of the electrolyte
 C) Weight of the cell D) Difference between E_{cathode} and E_{anode} .
 - Use of secondary reference electrode is preferred over primary reference electrode because
 A) it is light weight B) it is compact
 C) it is reversible with electrolyte D) it gives constant and reproducible potential. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 2 b. What are ion-selective electrodes? Explain the principle, construction and working of a glass electrode. (06 Marks)
- c. Derive the Nernst equation for a single electrode. Write Nernst equation for the given cell:
- $$\text{Cu (s)} \parallel \text{Cu}^{2+} (\text{aq}) \parallel \text{Ag}^+ (\text{aq}) \parallel \text{Ag} \quad (05 \text{ Marks})$$
- d. Calculate $E_{\text{Zn}^{2+}/\text{Zn}}^0$, if the emf of $\text{Zn} \mid \text{Zn}^{2+} (\text{a}=1) \parallel \text{Ni}^{2+} (\text{a}=1) \mid \text{Ni}$ is 0.51 and $\text{Ni} \mid \text{Ni}^{2+} (\text{a}=1) \parallel \text{SCE}$ is 0.49 V. Given $E_{\text{SCE}}^0 = 0.24\text{V}$. (05 Marks)
- 3 a. Select the correct answer:
- The electrolyte used in Li-MnO₂ battery is

A) 30% H ₂ SO ₄	B) 6M KOH
C) Li-halide and organic solvents	D) NH ₄ Cl + ZnCl ₂
 - Hot KOH solution should be used in H₂O₂ fuel cell

A) to increase conductivity	B) to enhance the absorption of hydrogen on anode
C) for better reduction of O ₂	D) to avoid dilution of KOH.
 - In some batteries, graphite is used as an additive, because

A) it reduces the total weight	B) it absorbs the moisture
C) it improves the conductivity	D) to increase the surface area of the electrode.
 - Lithium metal is used as anodic material in Lithium batteries because

A) it readily loses the electrons	B) its reduction potential is very high
C) its size is very small	D) it readily reacts with water.

 (04 Marks)
- b. What are the modern batteries? Explain the construction, reactions and applications of a Ni-MH battery. (06 Marks)
- c. Explain the following characteristics of a battery:
- Capacity
 - Cycle life. (05 Marks)
- d. How is a fuel cell, in which chemical energy is converted into electrical energy, more advantageous over the conventional batteries? Justify – “fuel cell is only an energy conversion device and not an energy storage device”. (05 Marks)
- 4 a. Select the correct answer:
- Appropriate corrosion control for a buried pipeline is

A) Painting	B) Cathodic protection	C) Cathodic coating	D) Metallic coating
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 - Cathodic coating is

A) coating of tin on iron	B) coating of zinc on iron
C) conversion of whole specimen into cathode	D) immersion into hot ZnCl ₂ soln.
 - A bolt and a nut made of the same metal is preferred in practice to avoid

A) stress corrosion	B) differential aeration corrosion
C) differential metal corrosion	D) caustic embrittlement.
 - The reaction at an anode during corrosion is

A) Oxidation	B) Reduction	C) Redox	D) Conversion.
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 (04 Marks)
- b. Define metallic corrosion. Discuss the following factors which influence the rate of corrosion: i) Nature of corrosion products ii) Hydrogen over-voltage (05 Marks)
- c. What is anodizing? Explain the anodizing of aluminium. (06 Marks)
- d. Write a note on phosphating. (05 Marks)

PART - B

- 5 a. Select the correct answer:
- 'Pickling' is
A) alkali cleaning B) acid cleaning C) organic solvent cleaning D) water cleaning
 - As temperature increases the electro-deposition
A) decreases B) increases
C) no effect D) first decreases and then increases
 - The experimentally determined discharge potential of an electrode is 2.58V and its theoretical discharge potential is 1.53V; then over-voltage is
A) 3.345 V B) -1.05 V C) 4.11 V D) 1.05 V
 - As over-voltage increases, electroplating
A) decreases B) increases C) no change D) increases and decreases. (04 Marks)
- b. Explain the significance of the following electroplating:
i) Polarization ii) Over-voltage. (08 Marks)
- c. Differentiate between electroplating and electroless plating. (04 Marks)
- d. Explain the surface propagation and electroplating of chromium on a steel material. (04 Marks)
- 6 a. Select the correct answer:
- The molecular ordering in nematic phase is
A) No positional order and orientational order
B) Perfect positional and orientational order
C) No positional but orientational order
D) Total loss in molecular ordering.
 - The layered structure is found in phase.
A) nematic B) discotic C) meso D) smectic
 - In potentiometric acid-base titration, the indicator electrode is
A) calomel B) Ag-AgCl C) Glass-electrode D) platinum
 - Mathematical expression of Beer-Lambert law is
A) $A = -\log T = Cl$ B) $A = \log T = Cl$
C) $\log(I_0/I_t) = \epsilon Cl$ D) $\log(I_t/I_0) = \epsilon Cl$ (04 Marks)
- b. What are the liquid crystals? Discuss the classification, with examples. (07 Marks)
- c. Explain the liquid crystalline behaviour in PAA homologous series. (04 Marks)
- d. Explain the theory behind the conductometric titration. Draw and explain the conductometric titration curve for the following titrations:
i) A strong acid and a strong base ii) A strong acid and a weak base. (05 Marks)
- 7 a. Select the correct answer:
- A polymer of high optical clarity used in preparation of lenses is
A) Teflon B) Phenol-formaldehyde C) Neoprene D) PMMA

- 7 a. ii) The glass transition temperature (T_g) depends on
 A) type of monomer used B) type of polymerization
 C) chemical resistance D) molecular weight
- iii) Monomer used in Teflon is
 A) fluorine B) bisphenol C) tetrafluoroethylene D) epichlorohydrin
- iv) The molecular weight of addition polymer is integral multiple of the molecular weight of monomer used because
 A) it is a linear polymer B) no solvent is added
 C) it involves a catalyst D) no elimination of byproducts (04 Marks)
- b. What is polymerization? Explain the solution polymerization. (05 Marks)
- c. Justify the following :
 i) Crystalline polymers possess higher strength than amorphous polymers.
 ii) Thermal control is rather difficult in bulk polymerization. (05 Marks)
- d. What are resins? Give the synthesis, properties and uses of phenol-formaldehyde. (06 Marks)
- 8 a. Select the correct answer:
 i) The purest form of water is
 A) river B) Borewell C) Rain D) Spring
- ii) In chloride analysis (Argentometric), the end point is brick-red, due to
 A) AgCr_2O_7 B) AgNO_3 C) AgCl D) Ag_2CrO_4
- iii) Complexing agent for spectrophotometric analysis of nitrate is
 A) SPADNS B) Ammonia C) Phenol sulphonic acid D) Phenol disulphonic acid
- iv) The method removing temporary hardness is
 A) soda process B) boiling C) distillation D) reverse osmosis (04 Marks)
- b. Define alkalinity. If 'P' represents the phenolphthalein alkalinity and 'M' represents the methyl orange alkalinity, for a given sample of water, how do you predict the types of alkalinity, when (i) $P = M$ (ii) $P = \frac{1}{2} M$ (iii) $P > \frac{1}{2} M$ (iv) $P < \frac{1}{2} M$? (05 Marks)
- c. A river courses first through a terrain rich in limestone and through a terrain rich in gypsum. Identify the type of hardness it accumulates in its path. Explain the need for maintaining a constant pH and the colour changes that occur, when the hardness of this water is being determined by titration against EDTA, using Eriochrome black-T as the indicator. (05 Marks)
- d. Give an account of the following:
 i) COD is higher than BOD.
 ii) HgSO_4 and Ag_2SO_4 are to be added during COD analysis.
 iii) Chlorine is a powerful disinfectant only at lower pH values. (06 Marks)

First/Second Semester B.E. Degree Examination, December 2010
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 in 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 : Mass of the electron = $m = 9.11 \times 10^{-31}$ kg, Charge of the electron = $e = 1.6 \times 10^{-19}$ C, Velocity of light = $c = 3 \times 10^8$ m/s, Planck's constant = $h = 6.626 \times 10^{-34}$ J-S, Boltzmann constant = $k = 1.38 \times 10^{-23}$ J/K, Permittivity of free space = $\epsilon_0 = 8.854 \times 10^{-12}$ F/m, Avogadro number = $NA = 6.022 \times 10^{26}$ /K mole.

PART - A

- 1 a. Choose your answers for the following :
- In the black body radiation spectrum, with increasing temperature, the wavelength corresponding to maximum intensity shifts towards :
A) Longer wavelength side B) Shorter wavelength side
C) Initially longer, later shorter wavelength side D) None of these
 - The Davisson Germer experiment establishes
A) Particle nature of X rays B) Dual nature of light
C) Dual nature of particles D) Wave nature of particles
 - For a wave packet
A) $V_{gp} = V_{particle}$ B) $V_{gp} = V_{phase}$ C) $V_{gp} = G$ D) None of these
 - For a photon and electron of equal wavelengths, their
A) Energies are equal B) Momenta are equal
C) Both A and B D) Neither A nor B (04 Marks)
- b. Define phase velocity and group velocity. Derive an expression for the de Broglie wavelength from the concept of group velocity. (10 Marks)
- c. An electron has a de Broglie wavelength 3 nm, and rest mass 0.511 eV. Determine its group velocity and kinetic energy. (06 Marks)
- 2 a. Choose your answers for the following :
- The eigen functions associated with a system are
A) Single valued and continuous B) Finite and continuous
C) Finite, single valued and continuous D) Infinite, continuous and single valued
 - In the expression $p = \sqrt{2mE}$ where p is the momentum, E represents
A) Kinetic energy B) Total energy C) Potential energy D) Rest energy
 - For a particle moving in a potential well, the probability of finding it anywhere over the width of the well is
A) 1.0 B) 0.0 C) 0.5 D) 1.5
 - For a free particle, the energy eigen values are
A) Quantized B) Continuous C) Zero D) None of these (04 Marks)
- b. Determine the energy eigen values and eigen functions for a particle in a one dimensional potential well of infinite height. (10 Marks)
- c. State Heisenberg's uncertainty principle. A spectral line of wavelength 546.1 nm has a width 10^{-5} nm. Estimate the minimum time spent by electrons in the excited state during transitions. (06 Marks)

- 3 a Choose your answers for the following :
- The unit (units) of electric field intensity, E , is (are)
A) Volt/m B) N/Coulomb C) J/Coulomb D) Both A and B
 - In a conductor, the resistivity, ρ , increases as
A) Temperature decreases B) Temperature increases
C) Does not depend on temperature D) None of these
 - The Fermi factor at E_{F_0} for $T > 0$ K is
A) 0 B) 0.5 C) 1.0 D) 0.25
 - The mobility μ of conduction electrons in a metal is given by
A) $\frac{E}{V_d}$ B) $\frac{V_d}{E}$ C) $\frac{\sigma}{ne}$ D) Both B and C (04 Marks)
- b. Derive an expression for the electrical conductivity, σ , in a metal. (06 Marks)
- c. Discuss any two successes (or merits) of the quantum free electron theory of conduction. (06 Marks)
- d. The Fermi level for a metal is 3.1 eV, Calculate the energies for which the probability of occupancy at 300 K are 98% and 50%. (04 Marks)

- 4 a. Choose your answers for the following :
- The dipole moment of two charges $+q$ and $-q$ separated by a distance d is given by
A) $+qd$ B) $-qd$ C) q^2/d D) q^2d
 - Temperature independent polarization mechanisms are
A) Electronic and orientational
B) Ionic and orientational
C) Electronic and space charge
D) Electronic and ionic
 - Ferroelectric materials are
A) Magnetic
B) Dielectrics
C) Magnetic materials which behave like dielectrics
D) Dielectric materials that behave like magnetic
 - In the B-H curve, the points X and Y represent respectively

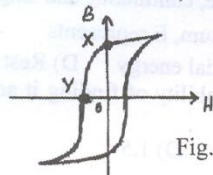


Fig.Q4(a)(iv)

- Coercive field and remnant magnetization (04 Marks)
 - Remnant magnetization and coercive field (08 Marks)
 - Saturation density and coercive field (04 Marks)
 - Remnant magnetization and susceptibility (04 Marks)
- b. Arrive at an expression for the internal field in a linear array of dielectric molecules placed in an electric field. (08 Marks)
- c. What is Lorentz field? Deduce Clausius Mossotti relation. (04 Marks)
- d. A solid dielectric material has electronic polarisability equal to 7×10^{-40} Fm^2 . If it is a cubic structure, calculate the relative permittivity of the material if it has 3×10^{28} atoms/ m^3 . (04 Marks)

PART - B

- 5 a. Choose your answers for the following :
- The life time of an electron in a metastable state is of the order of
A) Nano seconds B) Micro seconds C) Few seconds D) Milli seconds
 - The excitation mechanism for pumping in a diode laser is
A) Forward bias B) Optical C) Electrical discharge D) None of these
 - The energy of laser pulse is 10^{-10} J. If the power of the laser is 8 mW, the duration of the pulse is
A) 125 ns B) 0.125 ns C) 12.5 ns D) 1.25 ns
 - In the He-Ne laser the ratio of the partial pressures of He and Ne gases is
A) 1 : 10 B) 10 : 1 C) 1 : 100 D) 100 : 1 (04 Marks)
- b. Discuss the principle, construction and working of a semiconductor laser. State two advantages and two applications of the same. (12 Marks)
- c. The ratio of population of two energy states in a laser is 1.059×10^{-30} . If the temperature of the system is 57°C , what is the wavelength of the laser? (04 Marks)
- 6 a. Choose your answers for the following :
- Type - I superconductors are
A) Diamagnetic B) Paramagnetic C) Ferromagnetic D) Antiferromagnetic
 - For a superconductor, stronger the magnetic field applied to it
A) Higher is the critical temperature B) Lower is the critical temperature
C) Critical temperature remains same D) None of these
 - The number of modes supported by an optical fiber whose V. no. is 40 is
A) 1600 B) 1200 C) 800 D) 3200
 - The numerical aperture of an optical fiber is 0.309. Its angle of acceptance is approximately
A) 18° B) 17° C) 18.5° D) 17.5° (04 Marks)
- b. Derive the condition for ray propagation through an optical fiber. (06 Marks)
- c. Discuss the construction, working and applications of squids. (06 Marks)
- d. A signal with input power 200 mW loses 10% of its power after traveling a distance of 3000 m. Find the attenuation coefficient of the fiber. (04 Marks)
- 7 a. Choose your answers for the following :
- The inter atomic distance for the NaCl lattice is
A) 5.63 \AA B) 2.81 \AA C) 11.26 \AA D) 1.41 \AA
 - The number of lattice points/unit cell in diamond is
A) 4 B) 6 C) 2 D) 8
 - According to Bragg's law which of the following triplets corresponds to the first three orders of reflection?
A) $10^\circ, 23.9^\circ, 40.4^\circ$ B) $12^\circ, 24.57^\circ, 38.6^\circ$ C) $15^\circ, 38.4^\circ, 42^\circ$ D) $14^\circ, 28^\circ, 42^\circ$
 - In the Bragg's spectrometer, if the detector rotates by 6° , the crystal table would have rotated by
A) 3° B) 12° C) 2° D) 9° (04 Marks)

- b. Arrive at an expression for the inter planar spacing for a family of Bravais planes with miller indices (h, k, l) . (06 Marks)
- c. Determine the coordination number, number of lattice points per unit cell and atomic packing factor for the FCC lattice. (or face centred cubic lattice) (06 Marks)
- d. Draw the following planes in the unit cube: i) $(\bar{1}, 0, 2)$ ii) $(1, \bar{1}, \bar{2})$ (04 Marks)
- 8 a. Choose your answers for the following :
- i) Reduction of 3-d bulk material in all the three directions results in
 A) 2-d film B) 1 d wire C) Quantum dot D) Quantum particle
- ii) In mechanical scaling, the dimensional dependence of frequency is
 A) L^{-1} B) L C) L^2 D) L^{-2}
- iii) Which of these is not employed in non destructive testing?
 A) Ultrasound method B) Dynamic testing
 C) Testing by chemical interaction D) Magnetic methods
- iv) Ultrasonic waves in solids are
 A) Longitudinal B) Transverse
 C) Could be both A and B D) None of these (04 Marks)
- b. Write short notes on: i) Carbon nano tube ii) Self organization on the nano scale (08 Marks)
- c. Discuss the principle and working of the ultrasonic method of nondestructive testing. (08 Marks)

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06CCP13/23

First / Second Semester B.E. Degree Examination, December 2010
Computer Concepts & C-Programming

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**Select the correct answer:**

- 1 a. i) Which type of computer will you most likely encounter at the department of motor vehicles?
 A) Smart phone B) Mainframe
 C) Super computer D) Minicomputer
- ii) Which of the following devices stores the instruction that helps the computer start up?
 A) Joystick B) RAM
 C) ROM D) Monitor
- iii) When you press a key, this device notifies the system software.
 A) Key board B) Keyboard buffer
 C) Key board controller D) Network CPU
- iv) A computer's resolution is determined by _____
 A) Monitor B) Video controllers (04 Marks)
 C) CPU D) System unit (10 Marks)
- b. Explain the four categories of hardware devices.
- c. What is the difference between impact and non-impact printers? Classify the following printers into impact and non-impact printer:
 i) Dot matrix ii) Inkjet iii) Laser (06 Marks)

Select the correct answer:

- 2 a. i) The CPU uses a _____ to store and retrieve each piece of data in the memory.
 A) Control unit B) Cache
 C) Post D) Memory location
- ii) Most popular external connection for a PC is,
 A) PS2 B) USB
 C) HDX D) MIDI
- iii) Disketts spin at about _____ revolution per minute.
 A) 3 B) 30
 C) 300 D) 3000
- iv) To remove a system program from your computer you can _____ it.
 A) Uninstall B) Delete (04 Marks)
 C) Store D) Transfer (07 Marks)
- b. Explain the components required to process the data in a computer.
- c. Briefly explain the following processors:
 i) AMD ii) Free scale iii) IBM (09 Marks)

Select the correct answer:

- 3 a. i) In many GUI-based programs, a _____ displays buttons that let you issue commands quickly.
 A) Menu bar B) Scroll bar
 C) Command base D) Tool bar
- ii) DOS stands for,
 A) Distributed operating system B) Driver operating system
 C) Disk operating system D) Diskless operating system

Q3 (a)- contd...

- iii) In a _____ network, all devices are connected to a device called the hub and communicate through it,
 A) BUS
 C) Ring
 B) Star
 D) Mesh
- iv) Which command is used to remove data from one document and place it in another?
 A) Copy and paste
 C) Cut and paste
 B) Delete and paste
 D) Cut and delete
- b. What is an operating system? Explain the four types of OS with examples. (04 Marks)
- c. What is the need of network topology? Explain the following network topologies: (08 Marks)
- i) Bus topology ii) Star topology iii) Ring topology (08 Marks)

Select the correct answer:

- 4 a. i) The step by step procedure to solve a particular problem, is called
 A) Flow chart
 C) Instruction
 B) Program
 D) Algorithm
- ii) An infinite loop in a program sequence, causes no output but creates error. What type of error is it?
 A) Syntax error
 C) Run-time error
 B) Logical error
 D) None of these
- iii) Which translator converts high level language program into machine language?
 A) Assembler
 C) Compiler
 B) Computer
 D) Interpreter
- iv) Basic building blocks of C are,
 A) Keywords
 C) Constants
 B) Identifiers
 D) Variables (04 Marks)
- b. Write a flowchart to find the factorial of a given number. (06 Marks)
- c. What is the value of x, if $a = 10$, $b = 15$ and $x = (a > b)$? $a : b_i$ (02 Marks)
- d. What would be the value of c, if $a = 1$, $b = 2$? Mention the steps involved.
 i) $c = (a > 0 \ \&\& \ a \leq 10)$? $a + b : a/b_j$
 ii) $c = (a < 0 \ \&\& \ a \leq 10)$? $a + b : a/b_j$ (08 Marks)

PART - B

Select the correct answer:

- 5 a. i) To read a single character, which of the following equation is used?
 A) put char ()
 C) get ch ()
 B) get char ()
 D) put ch ()
- ii) Which operator has the highest precedence?
 A) +
 C) ++
 B) *
 D) >>
- iii) Switch expression can be _____ type.
 A) Float
 C) Integer
 B) Void
 D) Double
- iv) Which is the formatted console output function?
 A) get char ()
 C) scan f ()
 B) get ch ()
 D) print f () (04 Marks)
- b. What is the difference between IF..ELSE and switch statement? (04 Marks)
- c. Write a C program that will read the value of x and evaluate the following function:
 $y = 1 + x$, when $n = 1$
 $= 1 + x^n$, when $n = 2$
 $= 1 + nx$, otherwise
 using (i) else if statement (ii) switch statement (12 Marks)

Select the correct answer:

- 6 a. i) Identify the unconditional control statement in the following:
 A) If_Else
 B) Nested if
 C) Switch
 D) goto
- ii) What is the output of the following? For (i = 0; iL = 3; i++); printf ("%d", i);
 A) 0123
 B) 01
 C) 012
 D) garbage value
- iii) Which statement is called as bypasses?
 A) goto
 B) break
 C) continue
 D) switch
- iv) In the following, identify the non-looping statement;
 A) while
 B) do-while
 C) for
 D) switch
- b. Explain the following statements: (i) break (ii) goto. (04 Marks)
- c. Write a program to print the following output using for loops: (02 Marks)

```

1
2 2
3 3 3
4 4 4 4
5 5 5 5 5

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- d. Write a program to find the sum of ODD number beginning with i = 1 and upto n number,

$$\text{sum} = \sum_{i=1}^n x_i \text{ using}$$

- i) while loop
 ii) do_while loop
 iii) for loop

(09 Marks)

Select the correct answer:

- 7 a. i) Array elements must be enclosed within _____ to initialize the array.
 A) []
 B) ()
 C) { }
 D) " "
- ii) Size of an array is indicated by,
 A) integer
 B) float
 C) char
 D) double
- iii) What is the output of the following program segment?
 Main ()
 { int K [5] = (3, 5, 6, 8, 10);
 Print f ("%d", K[0]);
 }
 A) 3
 B) 32
 C) 8
 D) Error
- iv) Array is which data type?
 A) User defined
 B) Built_in
 C) Primary datatype
 D) Derived data type
- b. What is an array? How do you declare and initialize ONE and TWO dimension array? Explain with an example. (04 Marks)
- c. Write a program that accepts a 3×3 matrix and computes, (06 Marks)
- i) Transpose of the matrix.
 ii) Addition of diagonal elements. (10 Marks)

Select the correct answer:

- 8 a. i) If the return type of a function is int, then what is the value returned?
A) null B) void
C) int D) char
- ii) Identify the mathematical function in the following :
A) clrscr () B) printf ()
C) fabs () D) main ()
- iii) The process of splitting a lengthy and complex program into a number of smaller programs is called _____
A) unit program B) modules
C) built in program D) logical program
- iv) How many number of functions can be used in a program?
A) one only B) two only
C) eight only D) any number (04 Marks)
- b. Distinguish between:
i) Actual and formal arguments (06 Marks)
ii) Global and local variables. (06 Marks)
- c. Describe the two ways of passing parameters to function. When do you prefer to use each of them? Give examples. (10 Marks)

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06CIV13/23

First/Second Semester B.E. Degree Examination, December 2010
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:
 - i) Surveying deals with
 - A) Sub soil exploration
 - B) Estimation of quality and quantity of surface and subsurface water
 - C) Determination of correct distance between objects or stations
 - D) Design of super structure and substructures.
 - ii) Infrastructure development focuses on providing
 - A) Transportation facilities
 - B) Water system and drainage facilities
 - C) Power supply and communication facilities
 - D) All of these.
 - iii) Dams are
 - A) Constructed to cross a channel or flowing water
 - B) Barrier or obstacle constructed across a water stream
 - C) Constructed across a tunnel
 - D) None of the above.
 - iv) The roads connecting important towns, areas of production and market places, connecting with each other or with the main highway of a district are
 - A) Major district roads
 - B) Arterial roads
 - C) Expressways
 - D) None of these. (04 Marks)
 - b. Briefly explain scope of the following in civil engineering:
 - i) Surveying
 - ii) Geotechnical engineering
 - iii) Hydraulics. (09 Marks)
 - c. What are the different types of roads? Explain. Also, sketch a typical cross-section of a road. (07 Marks)
- 2 a. Select the correct answer:
 - i) IF a number of forces are acting simultaneously on a particle, then each of them will produce the same effect, which it would have done while acting alone. This is known as:
 - A) The principle of physical independence of forces
 - B) The principle of transmissibility of forces
 - C) The principle of resolution of forces
 - D) None of the above.
 - ii) IN order to determine the effects of forces acting on a body, we must know
 - A) its magnitude and point at which it acts on the body
 - B) direction of the line along which it acts
 - C) their nature (whether push or pull)
 - D) All of the above.
 - iii) Free body diagram of a body shows
 - A) A body isolated from all external forces
 - B) A body isolated from all its surroundings and all external forces acting on it
 - C) A body shown separately from its surroundings and all external and internal forces acting on it
 - D) None of the above.
 - iv) The effect of a couple is unchanged if
 - A) the couple is rotated through any angle
 - B) the couple is shifted to any other position
 - C) the couple is replaced by another pair of forces, whose rotational affects are the same
 - D) All of the above. (04 Marks)
 - b. Classify the systems of forces & their characteristics with an illustration. (10 Marks)
 - c. Reduce the system shown in Fig.Q2(c), to (i) single force (ii) single force and couple at A (iii) single force and couple at B (06 Marks)

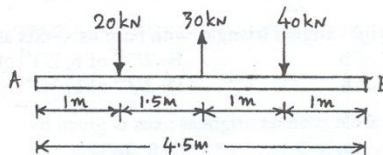


Fig.Q2(c)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

- 3 a. Select the correct answer:
- If a force F makes an angle θ with x -axis, the components of force with respect to x -axis and y -axis, respectively, are
 A) $F \cos\theta, F \sin\theta$ B) $F \sin\theta, F \cos\theta$ C) $F \tan\theta, F \sin\theta$ D) $F \sin\theta, F \sec\theta$
 - Direction of the resultant force can be determined by
 A) $\tan\theta = \left(\frac{\Sigma V}{\Sigma H}\right)$ B) $\tan\theta = \left(\frac{\Sigma H}{\Sigma V}\right)$
 C) $\tan\theta = \sqrt{(\Sigma H)^2 + (\Sigma V)^2}$ D) None of these
 - Varignon's principle of moments can be stated as
 A) Moment of resultant force R about ' X ' = Moment of force P about ' X ' \times Moment of force Q about ' X '
 B) Moment of resultant force R about ' X ' = Moment of force P about ' X ' \div Moment of force Q about ' X '
 C) Moment of resultant force R about ' X ' = Moment of force P about ' X ' + Moment of force Q about ' X '
 D) None of the above.
 - Moment of a force is defined as
 A) Linear effect of a force about a point B) Rotational effect of a force about a point
 C) Turbulent effect of a force about a point D) All of these
- b. The four coplanar forces acting at a point are as shown in Fig.Q3(b). One of the forces is unknown and its magnitude is as shown by ' F '. The resultant is 500 N and is along x -axis. Determine the force ' F ' and its inclination θ with x -axis. (04 Marks)

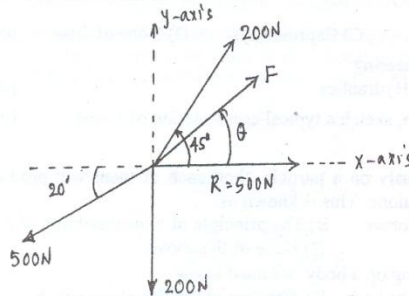


Fig.Q3(b)

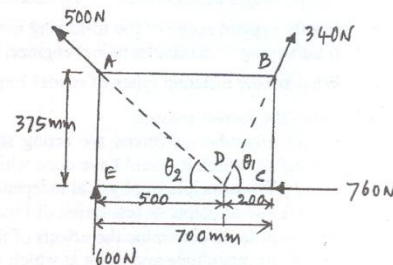


Fig.Q3(c)

- c. Four forces act on a 700mm \times 375mm plate as shown in Fig.Q3(c). Find (i) the resultant of these forces (ii) locate the point where the line of action of the resultant intersects the edge AB of the plate. (10 Marks)

- 4 a. Select the correct answer:
- The centre of gravity is a point
 A) at which the whole area of the plane figure is concentrated
 B) at which the whole volume of the body is concentrated
 C) at which the whole weight of the body acts
 D) All of the above
 - The centroid in x -direction in general is
 A) $\frac{\Sigma a}{\Sigma ax}$ B) $\frac{\Sigma ax}{\Sigma a}$ C) $\Sigma ax \times \Sigma a$ D) $\Sigma ax + \Sigma a$
 - The centroid of a right angled triangle, with base as x -axis and opposite side as y -axis is
 A) $1/3^{\text{rd}}$ of h , $1/3^{\text{rd}}$ of b B) $2/3^{\text{rd}}$ of b , $2/3^{\text{rd}}$ of h
 C) $1/3^{\text{rd}}$ of b , $2/3^{\text{rd}}$ of h D) $2/3^{\text{rd}}$ of b , $1/3^{\text{rd}}$ of h
 - The centroid of a circle with its origin as axes is given by
 A) r, r B) $0, 0$ C) $0, 4r/3\pi$ D) $4r/3\pi, 0$
- b. Locate the centroid of a triangle, from the first principles. (06 Marks)

- c. Determine the location of the centroid of the shaded portion of the lamina, shown in Fig.Q4(c), with respect to the origin 'O'. (10 Marks)

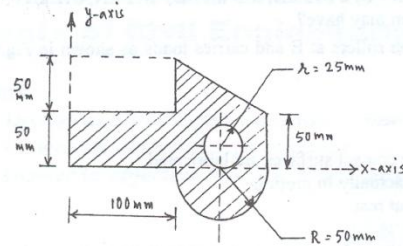


Fig.Q4(c)

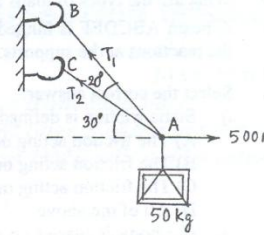


Fig.Q5(b)

PART - B

- 5 a. Select the correct answer:
- An equilibrant is a force
 - unequal in magnitude, opposite in direction and collinear with the resultant
 - equal in magnitude, opposite in direction and non-collinear with the resultant
 - equal in magnitude, opposite in direction and collinear with the resultant
 - unequal in magnitude, opposite in direction and non-collinear with the resultant
 - Equilibrium equations are
 - $\Sigma H = 0$
 - $\Sigma V = 0$
 - $\Sigma M = 0$
 - All of these
 - Lami's theorem is applicable for
 - Coplanar forces
 - Concurrent forces
 - Coplanar and concurrent forces
 - Any types of forces.
 - For a smooth spherical surface, reaction acts
 - inclined to the plane of contact
 - perpendicular to the plane of contact
 - horizontal to the plane of contact
 - All of these.
- (04 Marks)
- b. Determine the tension in cables AB and AC required to hold a 50 kg crate, shown in Fig.Q5(b). Take $g = 9.81 \text{ m}^2/\text{sec}$. (06 Marks)
- c. A system of connected flexible cables shown in Fig.Q5(c), is supporting two vertical forces 200 N and 250 N at points B and D. Determine the forces in various segments of the cable. (10 Marks)

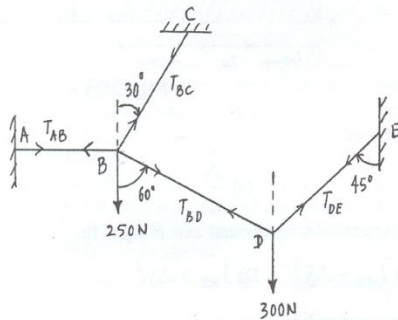


Fig.Q5(c)

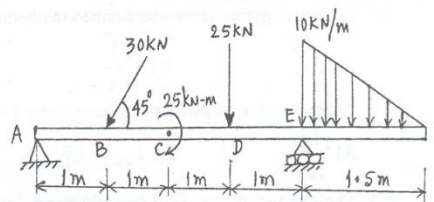


Fig.Q6(c)

- 6 a. Select the correct answer:
- When the reaction at a support consists of a moment, a vertical force and a horizontal force, then that support is called as
 - Hinged support
 - Roller support
 - Fixed support
 - Simple support
 - A single span beam is statically determinate when
 - both the ends are fixed
 - One end is fixed, other end is simply supported
 - One end is hinged and other is roller supported
 - Both ends are hinged.
 - A beam AB is fixed at one end, free at the other, and loaded by a concentrated load W at the free end. Then developed reaction R_A , will be equal to
 - $W/3 \text{ kN}$
 - $W \text{ kN}$
 - $W/2 \text{ kN}$
 - $2W/3 \text{ kN}$

- iv) If W kN/m uniformly distributed load is acting on a simply supported beam AB , then reactions R_A and R_B will be equal to
 A) $W/3$ kN, $2W/3$ kN B) $W/4$ kN, $3W/4$ kN C) $2W/3$ kN, $W/3$ kN D) $W/2$ kN, $W/2$ kN (04 Marks)
- b. What are the types of loads and supports a beam may have? (06 Marks)
- c. A beam $ABCDEF$ is hinged at A , supported on rollers at E and carries loads as shown in Fig.Q6(c). Determine the reactions at the supports. (10 Marks)

- 7 a. Select the correct answer:
- i) Static friction is defined as
 A) The friction acting on a body, when the contact surfaces are lubricated.
 B) The friction acting on a body, which is actually in motion
 C) The friction acting on a body, which is at rest
 D) All of the above.
 - ii) If a body is placed on an inclined plane, then, the angle at which the body is just at the point or verge of sliding down, is called
 A) Angle of friction B) Cone of friction C) Coefficient of friction D) Angle of repose.
 - iii) The magnitude of the force of friction between two bodies, one lying above the other, depends upon the roughness of the
 A) upper body B) lower body C) both the bodies D) the body having more roughness
 - iv) A uniform ladder of weight W and length ' L ' rests on horizontal ground and leans on a rough vertical wall with angle ' θ '. When a man stands on the ladder, the ladder slips towards
 A) left at the ground and towards up at the wall
 B) left at the ground and towards down at the wall
 C) right at the ground and towards up at the wall
 D) right at the ground and towards down at the wall (04 Marks)
- b. Explain : i) Types of friction ii) Laws of friction (06 Marks)
- c. A 4m ladder weighing 200 N is placed against a vertical wall is shown in Fig.Q7(c). As a man weighing 800 N, reaches a point 2.7m from A , the ladder is about to slip. Assuming that the coefficient of friction between the ladder and the wall is 0.2, determine the coefficient of friction between the ladder and the floor. (10 Marks)

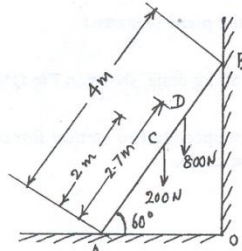


Fig.Q7(c)

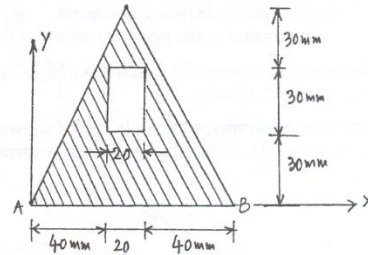


Fig.Q8(c)

- 8 a. Select the correct answer:
- i) Radius of gyration may be defined mathematically as
 A) $\sqrt{\frac{A}{I}}$ B) $\sqrt{\frac{I}{A}}$ C) $\frac{I}{A}$ D) $\frac{A}{I}$
 - ii) Moment of inertia of a plane area about 1-1 axis parallel to centroidal axis is equal to
 A) $\frac{I_{xx}}{A\bar{y}^2}$ B) $I_{xx} \times A\bar{y}^2$ C) $I_{xx} - A\bar{y}^2$ D) $I_{xx} + A\bar{y}^2$
 - iii) The moment of inertia of triangle about the base is given by
 A) $\frac{\pi}{64}(D^4 - d^4)$ B) $\frac{bh^3}{36}$ C) $\frac{bh^3}{12}$ D) $\frac{\pi d^3}{256}$
 - iv) Moment of inertia of a semicircle about centroidal axis is given by
 A) $0.055 r^4$ B) $0.11 r^4$ C) $0.11 d^4$ D) $\frac{\pi d^4}{64}$ (04 Marks)
- b. State and prove the parallel axis theorem. (04 Marks)
- c. Determine the moment of inertia and radii of gyration of the area shown in Fig.Q8(c), about the base AB and the centroidal axis parallel to AB . (12 Marks)

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06ELN15/25

First/Second Semester B.E. Degree Examination, December 2010

Basic Electronics

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two questions 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 right answer :
- i) What kind of a device is a diode?
 A) Bilateral B) Linear C) Nonlinear D) Unipolar
- ii) How is nonconducting diode biased?
 A) Forward B) Reverse C) Poorly D) None of these
- iii) What is the value of the current (I) in the circuit shown in Fig.Q1(a)(iii)
 Given $V_r = 0.7$ V.

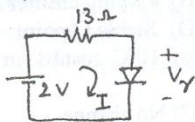


Fig.Q1(a)(iii)

- A) 0.5 A B) 0.4 A
 C) 0.1 A D) None of these

- iv) If the line frequency is 60 Hz, the output frequency of a half wave rectifier is
 A) 30 Hz B) 60 Hz C) 120 Hz D) 0 Hz (04 Marks)
- b. For a typical P.N junction diode, define the terms : i) Knee voltage and ii) Reverse saturation current. Also indicate them on a typical V-I characteristic curve. (04 Marks)
- c. Design a zener voltage regulator to meet the following specifications:
 Output voltage = 5 V load current = 10 mA
 zener wattage = 100 mW input voltage = 10 V \pm 2 V. (04 Marks)
- d. Derive an expression for ripple factor and output dc voltage, in case of a full wave rectifier with a capacitor filter. (08 Marks)

- 2 a. Select the right answer :
- i) In a CE configuration circuit, if the base resistor is open the Q point will be :
 A) In the middle of the load line B) At the upper end of the load line
 C) At the lower end of the load line D) OFF the load line.
- ii) In a BJT the collector current is 10 mA, if the current gain is 100, the base current is
 A) 1 μ A B) 10 μ A C) 100 μ A D) 1 mA
- iii) Find the collector current in the circuit shown in Fig.Q2(a)(iii)

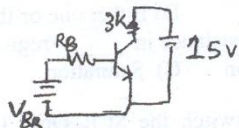


Fig.Q2(a)(iii)

- A) 2 mA
 B) 3 mA
 C) 10 mA
 D) None of these

- iv) ' α ' and ' β ' in a BJT are connected by the equation
 A) $\alpha = \frac{\beta}{1-\beta}$ B) $\beta = \frac{\alpha}{1-\alpha}$ C) $\alpha = \frac{\beta}{1+\beta}$ D) Both B and C

(04 Marks)

- 2 b. For the CE circuit shown below in Fig.Q2(b), draw the DC load line and mark the dc operating point in the active region. Indicate respective V_{CEQ} and I_{CQ} values. Given $\beta = 100$ and neglect V_{BE} . (06 Marks)

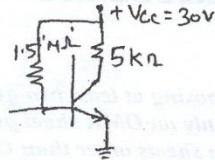


Fig.Q2(b)

- c. Explain the input and output characteristics for a CE configuration BJT circuit. Discuss each region on the characteristics. (06 Marks)
- d. Compare various BJT circuit configurations. (04 Marks)
- 3 a. Select the right answer :
- Majority carriers in the emitter of pnp transistor are
A) Holes B) Free electrons C) Trivalent atoms D) Pentavalent atoms
 - Voltage divider bias is noted for its
A) Unstable collector voltage B) Varying emitter current
C) Large base current D) Stable Q point
 - In a PN junction a temperature change of 10°C results in _____ of reverse leakage current
A) Doubling B) Tripling C) No change D) Both B and C
 - Thermal runaway in a BJT is a
A) Useful phenomenon B) Tolerable phenomenon
C) Destruction phenomenon D) Both A and B (04 Marks)
- b. Draw a voltage divider bias circuit and derive an expression for its stability factor. (08 Marks)
- c. A collector to base bias has $V_{CC} = 15\text{ V}$, $R_C = 5.6\text{ K}\Omega$, $R_B = 82\text{ K}\Omega$ and $V_{CE} = 5\text{ V}$. Determine the transistor h_{fe} value. Assume a silicon transistor. (04 Marks)
- d. Explain thermal runaway in the case a BJT. (04 Marks)
- 4 a. Select the right answer :
- The minimum anode current that keeps a thyristor turned ON is called the
A) Holding current B) Break over current
C) Trigger current D) Latching current
 - Input impedance of JFET
A) Approaches to zero B) Approaches one
C) Approaches to ∞ D) Is impossible to predict
 - A unipolar transistor uses
A) Both free electrons and holes B) Only free electrons
C) Only holes D) Either one or the other but not both
 - JFET acts like a voltage controlled resistance in _____ region.
A) Cut off B) ohmic region C) Saturation D) None of these (04 Marks)
- b. Is continuous gate current necessary to switch the SCR ON? Justify. How the SCR is switched OFF? (04 Marks)
- c. Sketch the V-I characteristics of VJT, indicate each region and explain the shape of the characteristic curve. (06 Marks)
- d. Illustrate SCR as a controlled rectifier. (06 Marks)

PART - B

- 5 a. Select the right answer :
- An oscillator always needs an amplifier with
 - Positive feedback
 - Negative feedback
 - Both A and B
 - An LC tank circuit
 - Overall voltage gain with negative feedback (A_{CL}) in terms of open loop gain (A_{OL}) and feedback factor (β) are given by
 - $\frac{A_{OL}}{1+\beta A_{OL}}$
 - $\frac{A_{OL}}{1-\beta A_{OL}}$
 - $\frac{A_{OL}}{1\pm\beta A_{OL}}$
 - None of these
 - For high frequency oscillators normally _____ elements are used in the feedback circuit.
 - LC
 - RC
 - Either A or B
 - Both A and B
 - Frequency output of an RC phase shift oscillator is given by
 - $f = \frac{1}{2\pi RC}$
 - $f = \frac{1}{2\pi RC\sqrt{6}}$
 - $f = \frac{1}{2\pi\sqrt{LRC}}$
 - None of these
- (04 Marks)
- b. Draw the circuit of a two stage R-C coupled CE amplifier. Explain significance of each component. Plot its frequency response. (10 Marks)
- c. Discuss the effect of negative feedback on the bandwidth and voltage gain of an amplifier. (06 Marks)

- 6 a. Select the right answer :
- OPAMP voltage follower has a voltage gain of approximately
 - Unity
 - Zero
 - Infinity
 - None of these
 - Ideal OPAMP has a CMRR equal to
 - Zero
 - Infinity
 - Unity
 - None of these
 - If V_1 and V_2 are input voltages of a non inverting adder circuit, output voltage (V_0) is given by
 - $(V_1 + V_2)$
 - $-(V_1 + V_2)$
 - $V_1 - V_2$
 - None of these
 - An OPAMP has a voltage gain of 5×10^5 . If the output voltage is 1 V, the input voltage is
 - 2 μ V
 - 5 mV
 - 10 mV
 - 1 V
- (04 Marks)
- b. Write expressions for output voltage at points A, B, C, D and E in the circuit shown in Fig.Q6(b).

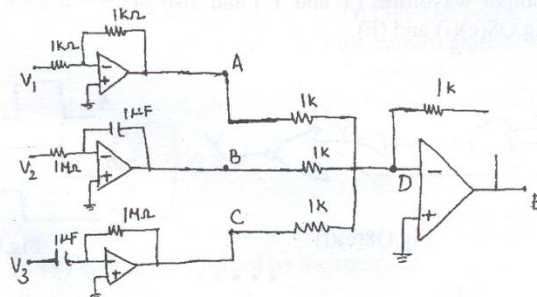


Fig.Q6(b)

- c. List some important characteristics of an ideal OPAMP.

(10 Marks)

(06 Marks)

- 7 a. Select the right answer :
- $(ABCD)_{16} = (\quad)_8$
 A) 125715 B) 13715 C) 125710 D) None of these
 - Relation between modulation index (m_a), total modulated current (I_t) and unmodulated (I_c) current, in case of AM wave is given by
 A) $I_t = I_c \sqrt{1 + \frac{m_a^2}{2}}$ B) $I_t = I_c \left(1 + \frac{m_a^2}{2}\right)$
 C) $I_c = I_t \sqrt{1 + \frac{m_a^2}{2}}$ D) None of these
 - Term "IF" in an AM receiver refers to
 A) Intermediate frequency B) Introductory frequency
 C) Interlock frequency D) None of these
 - Mixer is a building block of
 A) AM receiver B) FM receiver C) AM transmitter D) None of these

(04 Marks)

Obtain an expression for total average power of sinusoidal AM wave.

(05 Marks)

- When the modulation percentage is 75%, an AM transmitter radiated 10 KW. How much of this is carrier power? (05 Marks)
- Draw the clock diagram of a super heterodyne receiver and explain the function of each stage. (06 Marks)

- 8 a. Select the right answer :
- Boolean expression for XNOR gate is
 A) $Y = A\bar{B} + BA$ B) $Y = \bar{A}\bar{B} + AB$ C) $Y = A\bar{B} + \bar{A}B$ D) None of these
 - If two inputs of NAND gate are shorted and input is applied its output will be _____ of the input
 A) complement B) Double C) No change D) Both A and B
 - Universal gates are
 A) NAND and NOR B) AND and OR C) Both A and B D) None of these
 - $\overline{A+B+1} =$ _____
 A) 0 B) 1 C) $\bar{A} + \bar{B} + \bar{1}$ D) $\bar{A} \cdot \bar{B} \cdot \bar{1}$ (04 Marks)
- Simplify the following expression and implement using NAND gates only:
 i) $XYZ + YZ + \bar{Z}$ ii) $\bar{A}B + \bar{B}A$ (06 Marks)
 - Draw the output waveform (Y and Y') and also prepare a truth table for the circuit given below in Fig.Q8(c)(i) and (ii). (10 Marks)

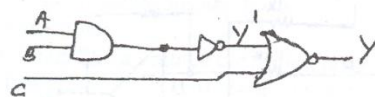


Fig.Q8(c)(i)

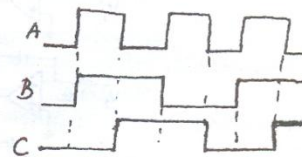


Fig.Q8(c)(ii)

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06ELE15/25

First/Second Semester B.E. Degree Examination, December 2010
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. Select the correct answer:
- Polarity of voltage drop across a resistor is determined by the _____.
A) Value of the resistor B) Value of current through resistor
C) Direction of current through the resistor D) Polarity of voltage source.
 - If 125V is applied across a 250V, 100 W bulb, the power consumption will be _____.
A) 100 W B) 50 W C) 25 W D) 12.5 W
 - A coil of 1500 turns gives rise to a magnetic flux of 2.5 mWb, when carrying a certain current. If the current is reversed in 0.2 secs, the average emf induced in the coil is _____.
A) 18.75 V B) 37.5 V C) 12.5 V D) None of these
 - The direction of induced emf in a coil is determined by _____
A) Faraday's law B) Lenz's law C) Fleming's left hand rule D) Ohm's law
- b. Derive an expression for the energy stored in an inductor. (04 Marks)
- c. Define the coefficient of coupling and the coefficient of mutual induction. Write one expression for each. (04 Marks)
- d. Two batteries are connected as shown in Fig.Q1(d), to a 200V supply. Battery A has an emf of 110V and internal resistance of 0.2 ohm. Battery B has an emf of 100V and internal resistance of 0.25 ohm. Determine the magnitude and direction of the current in each battery and the total current taken from the supply. (08 Marks)

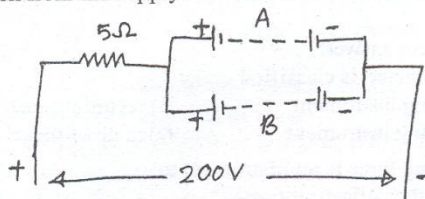
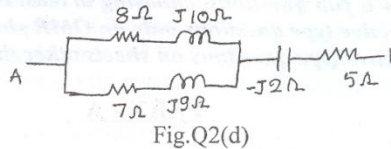


Fig.Q1(d)

- 2 a. Select the correct answer:
- The RMS value of a half wave rectified sine wave is _____
A) 0.707 Em B) 0.5 Em C) 0.637 Em D) 1.11 Em
 - The real and imaginary part of admittance are called _____
A) Resistance and reactance B) Conductance and suceptance
C) Conductance and reactance D) Resistance and suceptance
 - A coil of power factor 0.6 lag is represented as _____
A) R circuit B) L circuit C) R-L circuit D) R-C circuit
 - The unit of apparent power is _____.
A) Watts B) Vars C) VA D) Joules (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- b. With usual notations, prove that power connected in a R-L or R-C series circuit is $V \cos \theta$. (04 Marks)
- c. A current of 5A flows through a non-inductive resistance, in series with a coil, when supplied at 250V, 50Hz. The voltage across the resistance is 125V and across the coil 200V. Find the resistance and reactance of the coil and the power absorbed by the coil. (06 Marks)
- d. In the arrangement shown in Fig.Q2(d), calculate the impedance across AB and the phase angle between the voltage and the current. (06 Marks)



- 3 a. Select the correct answer:
- The algebraic sum of instantaneous phase voltages in a 3-phase circuit is _____.
A) Three times the phase voltage B) Line voltage
C) Zero D) None of these.
 - One wattmeter used in a 3-phase circuit shows negative reading when (measurement of power) _____.
A) connections are wrong B) the p.f. is less than 0.5
C) the load is resistive D) the phase sequence is reversed.
 - A balanced delta connected load consumes more power than star connected load (Load/ph is the same) because _____.
A) power factors are different B) line current is more
C) delta is a closed path D) none of these.
 - A 3-phase equipment has a size _____ that of a single phase equipment for the same power capacity.
A) same as B) bigger than C) smaller than D) none of these. (04 Marks)
- b. "Both the power and the power factor in a 3-phase circuit can be measured using two wattmeters". Prove this giving relevant circuit and vector diagram. (10 Marks)
- c. A balanced 3-phase star connected load of 150 kW takes a leading current of 100 A, with a line voltage of 1100V, 50Hz. Find the circuit constants of the load per phase. (06 Marks)
- 4 a. Select the correct answer:
- An energy meter is classified under _____.
A) indicating instrument B) recording instrument
C) integrating instrument D) none of these
 - The damping force is an instrument to _____.
A) oppose the deflecting force
B) oppose the controlling force
C) to bring the pointer to steady position quickly
D) to protect the instrument
 - The earth potential is always taken as _____ for all practical purposes.
A) ∞ B) 0 C) 10 V D) -10 V
 - A fuse is a _____.
A) protective device B) current limiting device
C) voltage limiting device D) unnecessary part of a circuit. (04 Marks)
- b. With a neat circuit diagram, explain the construction and operation of a dynamometer wattmeter. (07 Marks)
- c. Give a circuit diagram and switching table for three way control. Where is it used? (06 Marks)
- d. What is earthing? What are the merits of earthing? (03 Marks)

PART – B

- 5 a. Select the correct answer:
- The armature of a d.c. machine is made up of laminated sheets in order to _____.
A) reduce armature copper loss B) reduce eddy current loss
C) reduce hysteresis loss D) increase the dissipation of heat.
 - In a d.c. series motor, the torque developed is 20 N.m at 10A. If the current is doubled the new torque will be _____
A) 60 N.m B) 40 N.m C) 80 N.m D) 100 N.m
 - Commutator in a dc generator is used for _____.
A) converting dc to ac B) changing ac to dc
C) collecting the current from armature D) reducing the friction.
 - The back emf of dc motor at the moment of starting is _____.
A) maximum B) zero C) minimum D) Optimum. (04 Marks)
- b. Show that speed of a dc motor is directly proportional to the back emf and inversely proportional to the flux/pole. (04 Marks)
- c. Mention the classification of d.c. generators. (04 Marks)
- d. A 250V shunt motor on no-load, runs at 1000 rpm and takes 5A. The armature and shunt field resistances are respectively 0.2 ohm and 250 ohm. Calculate the speed of the motor when loaded and taking a current of 50A, if the armature reaction weakens the field by 3%. (08 Marks)
- 6 a. Select the correct answer:
- An ideal transformer does not change _____.
A) voltage B) power C) current D) None of these.
 - The copper loss of a certain transformer at half full load is measured as 400 W. Then the copper loss at full load will be _____
A) 800 W B) 200 W C) 400 W D) 1600 W.
 - The volts per turn in the primary winding of a transformer is _____ the volts per turn in the secondary.
A) less than B) same as C) more than D) none of these.
 - When a transformer is operating on no-load, the primary applied voltage is approximately balanced by _____.
A) secondary emf induced B) primary induced emf
C) voltage drop in the transformer D) none of these. (04 Marks)
- b. A 50 kVA transformer has an efficiency of 98% at full load, 0.8 pf and 97% at the half full load, 0.8 pf. Determine the full load copper loss and iron loss. Find the load at which the maximum efficiency occurs. Also, find the maximum efficiency. (08 Marks)
- c. With usual notations, prove that $E_2/E_1 = I_1/I_2 = N_2/N_1$ for a transformer. (06 Marks)
- d. Define regulation of a transformer. What is its significance? (02 Marks)
- 7 a. Select the correct answer:
- Synchronous speed of an IM can be increased by _____.
A) reducing the mechanical friction B) increasing the supply voltage
C) increasing the number of poles D) increasing the frequency of supply.
 - A 4 pole, 50 Hz, induction motor runs at a speed of 1440 rpm. The frequency of rotor current is _____.
A) 3 Hz B) 2.5 Hz C) 2 Hz D) 1 Hz.

- iii) The rotor circuit of a 3-phase induction motor under running condition is _____
 A) always closed B) always open
 C) sometimes closed and sometimes open D) None of these.
- iv) A 50 Hz, 3-phase induction motor under full load has a speed of 720 rpm. Then the number of poles of motor is equal to _____.
 A) 2 B) 4 C) 8 D) 16. (04 Marks)
- b. Explain the working principle of a 3-phase induction motor. Derive the relationship between the frequency of rotor induced emf, and frequency of supply. (08 Marks)
- c. Explain the process of producing the rotating magnetic field, in a 3-phase induction motor. (06 Marks)
- d. Why an induction motor needs a starter? (02 Marks)
- 8 a. Select the correct answer:
- i) An alternator field structure is normally of _____.
 A) stationary type B) revolving type C) vibrating type D) None of these.
- ii) Non-salient pole type rotor of an alternator has _____.
 A) larger diameter and long axial length
 B) smaller diameter and long axial length
 C) larger diameter and smaller axial length
 D) smaller diameter and smaller axial length
- iii) Winding factor appears in emf equation of an alternator because _____.
 A) winding is concentrated
 B) coil is full pitched
 C) winding is distributed and short pitched
 D) winding is accommodated in the stator.
- iv) A 4 pole, 50Hz synchronous alternator is made to run at _____.
 A) 700 rpm B) 1490 rpm C) 1500 rpm D) 3000 rpm. (04 Marks)
- b. With the help of sketches, explain the different parts of an alternator. Mention their salient features. (08 Marks)
- c. A 6 pole, 3-phase, star connected alternator has an armature with 90 slots and 10 conductors per slot. It revolves at 1000 rpm. The flux per pole is 0.05 Wb. Calculate the emf generated per phase, if the winding factor is 0.97 and all conductors in each phase are in series. (08 Marks)

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Question Paper Version : C

**I / II Semester B.E Degree Examination, December 2010
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.
2. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
3. Darkening two circles for the same question makes the answer invalid.
4. **Damaging/overwriting and using whiteners** on the **OMR** sheet are strictly prohibited.

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1. Alternative eco – friendly fuel for automobiles is
a) Petrol b) Diesel c) CNG d) Kerosene
 2. Population explosion will cause
a) Biodiversity b) Stress on the ecosystem
c) More employment d) None of these
 3. The meaning of global warming is
a) Increase in temperature of climate b) Solar radiation
c) A planet hotter than earth d) Cooling effect
 4. Which greenhouse gas is colourless, non – flammable, has a sweetish odour and known as laughing gas?
a) Methane b) Nitrous oxide c) CO₂ d) Nitric acid
 5. Demography is the study of
a) Animal behaviour b) Population growth
c) Trees in forest d) Animals in forest
 6. The pH value of acid rain water is
a) 5.7 b) 7.0 c) 8.5 d) 7.5
 7. Ozone layer is present in _____
a) Troposphere b) Stratosphere c) Mesosphere d) Thermosphere

8. Ozone layer thickness is measured in
 - a) PPM
 - b) PPB
 - c) Decibles
 - d) Dobson units
9. Which of the following statement is not true about animal husbandry?
 - a) It is a part of agricultural activity
 - b) It is breeding, feeding and management of animals
 - c) It is livestock production
 - d) It is protection of wild life.
10. Ozone hole was first discovered over
 - a) Antarctica
 - b) Arctic
 - c) Africa
 - d) USA
11. Acid rain has been increasing day by day due to
 - a) Urbanisation
 - b) Increase in vehicle population
 - c) Industrialization
 - d) All of these
12. Environmental education is targeted to
 - a) General public
 - b) Technicians and Scientists
 - c) Professional social groups
 - d) All of these
13. ISO 14000 standards deal with
 - a) Pollution management
 - b) Risk management
 - c) Environmental management
 - d) None of these
14. The first International Earth summit was held at
 - a) Johannesburg
 - b) Rio de Janeiro
 - c) Kyoto
 - d) Stockholm
15. Biosphere is
 - a) The solid shell of inorganic materials on the surface of the Earth
 - b) The thin shell of organic matter on the surface of earth, comprising of all the living things
 - c) The sphere which occupies the maximum volume of all of the spheres
 - d) All of these.
16. The objective of environmental education is to
 - a) Raise consciousness about environmental conditions
 - b) Teach environmentally by appropriate behaviour
 - c) Create an environmental ethic
 - d) All of these
17. Environmental (protection) Act was enacted in the year
 - a) 1986
 - b) 1992
 - c) 1984
 - d) 1974
18. Eutrophication is
 - a) an improved quality of water in lakes
 - b) a process in carbon cycle
 - c) the result of accumulation of plant nutrients in water bodies
 - d) a water purification technique.
19. Global atmospheric temperatures are likely to be increased due to
 - a) Burning of fossil fuels
 - b) Water pollution
 - c) Soil erosion
 - d) None of these

20. Which of the following is the most environmental friendly agricultural practice?
a) Using chemical fertilizers b) Using insecticides
c) Organic farming d) None of these
21. Water logging is a phenomenon in which
a) Soil root zone becomes saturated due to over irrigation
b) Crop patterns are rotated
c) Erosion of soil occurs d) None of these
22. What would you do to prevent environmental damage?
a) Plant trees b) Halt deforestation
c) Control pollution d) All of these
23. E.I.A can be expanded as
a) Environment and Industrial Act b) Environmental Impact Assessment
c) Environmentally Impact Activity d) Environment and Impact Activities.
24. Habitat refers to
a) Physical conditions of the place where the organisms live
b) Chemical conditions of the place where the organisms live
c) Both 'a' and 'b' d) None of these.
25. World 'Environment – Day' is on
a) 5th June b) 16th August c) 18th July d) 5th May
26. A food web consists of
a) A portion of a food chain b) Interlocking food chains
c) A set of similar consumers d) An organism position in food chain.
27. Deforestation means
a) Destruction of forests. b) Agriculture
c) Monocrop cultivation d) Preservation of forests.
28. Which of the following statements about forest is not correct?
a) Forest reduces soil erosion b) Provides recreational opportunities
c) Provides a source of economic development d) None of these
29. How do dams affect deforestation?
a) Open previously inaccessible forest to public b) Submerges forest
c) Damages downstream ecosystem d) All of these
30. India has the world's largest share of
a) Mica b) Copper c) Manganese d) Diamond
31. Identify the nonrenewable source of energy from the following :
a) Coal b) Solar Energy c) Wind power d) Water power
32. Conversion of nitrates into gases of nitrogen is called____
a) Nitrification b) Nitrogen fixing c) Reduction d) Dinitrification
33. Cholera and typhoid are caused by
a) Worms b) Bacteria c) Virus d) Fungus
34. Disfigurement in the teeth is caused by excessive amount of
a) Fluoride b) Nitrate c) Mercury d) Calcium

35. Solar radiation consists of
a) UV rays b) Visible light c) Infrared rays d) All of these
36. Which of the following is the conventional source of energy?
a) Hydel - power b) Thermal power c) Nuclear power d) All of these
37. Electromagnetic radiation can cause
a) Luekemia b) Cancer c) Genetic damage d) All of these
38. Chernobyl nuclear disaster took place in
a) 1986 b) 1982 c) 1996 d) 1992
39. Biomass consists of
a) Lignin b) Cellulose c) Hemi cellulose d) All of these
40. One gram of Uranium - U235 can give an electrical energy equivalent to
a) 1MW b) 100 MW c) 10 MW d) 1000 MW
41. A long term atmospheric impact of burning fossil fuel is _____
a) Global warming b) Oxygen consumption
c) Reduction in photosynthesis d) All of these
42. The process of killing infective micro – organisms is called as
a) Disinfection b) Sedimentation c) Sterilisation d) Coagulation
43. What is the maximum allowable concentration of fluorides in drinking water?
a) 1.5 mg/lit b) 1.0 mg/lit c) 1.25 mg/lit d) 1.75 mg/lit
44. Excess fluoride in drinking water is likely to cause
a) Blue babies b) Fluorosis
c) Taste and odour d) Intenstinal Irritation
45. Sanitary sewage / domestic sewage is
a) Wastewater generated from kitchens and bathrooms
b) Wastewater generated from residential areas
c) Water entering a sewer as a result of rainfall
d) Wastewater from industries.
46. BOD means
a) Biochemical oxygen demand b) Chemical oxygen demand
c) Biophysical oxygen demand d) Biological oxygen demand
47. Smog is
a) A natural phenomenon b) Colourless
c) Combination of smoke and fog d) All of these
48. Maximum noise pollution limit at a residential area is
a) 45 dB b) 80 dB c) 55 dB d) 90 dB
49. Noise pollution is controlled by
a) Reducing the noise at the source b) Preventing its transmission
c) Protecting the receiver d) All of these
50. Which of the following is a likely characteristic of hazardous waste?
a) Ignitability b) Carrosivity c) Reactivity d) Any of these

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Question Paper Version : C

First/Second Semester B.E Degree Examination, December 2010
Constitution of India and Professional Ethics
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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

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1. Minority groups are recognized on the basis of their
a) Population b) Religion c) Race d) Caste
 2. Who is empowered to nominate Anglo-Indian community to LS/LA?
a) Speaker of LS/LA b) President / Governor
c) Prime Minister/Chief Minister d) None of these
 3. While proclamation of emergency is in operation, the president cannot suspend certain fundamental right. They are
a) 32 b) 14 and 15 c) 14 and 16 d) 20 and 21
 4. President can proclaim emergency on the recommendation of the union cabinet. Such recommendation shall be
a) Oral recommendation b) Majority in the house
c) Written recommendation d) Sincere request.
 5. If a state fails to comply with the directives of the central government, the president can
a) Dissolve the state legislation and order fresh elections.
b) Declare breakdown of the constitutional machinery in the state and assume responsibility for its government.
c) Send reserve police force to secure compliance with directions
d) do either (b) or (c).
 6. Who has the duty to protect states against external aggression and internal disturbance?
a) Union government b) State government
c) Army d) No such duty in federal state.

7. The election system of India is largely based on the pattern of
 - a) France
 - b) USA
 - c) Britain
 - d) None of these
8. The Chief Election Commissioner (CEC) is
 - a) Appointed by the union home minister
 - b) Appointed by the prime minister
 - c) Elected by the parliament
 - d) Appointed by the president.
9. Which article under the constitution gives power to EC to conduct elections?
 - a) 234
 - b) 324
 - c) 335
 - d) 320
10. The party system in India can be described as
 - a) Single – party
 - b) Multi – party
 - c) B1 – party
 - d) A mixture of all these
11. Professional ethics is
 - a) Set of rules relating to personal character of professionals.
 - b) Traditional rules observed since a long time.
 - c) Set of rules passed by professional bodies.
 - d) Set of standards adopted by professionals.
12. Engineering profession is considered to be like a building, its foundation is
 - a) Sound common sense & expert knowledge
 - b) Hard and sincere
 - c) Honey
 - d) Expert engineering knowledge and skill.
13. One of the aims of engineering ethics is to
 - a) Stimulate the moral imagination.
 - b) Inspire engineers to acquire in – depth knowledge in their field.
 - c) Acquire new skills in engineering testing and research.
 - d) Make engineers self - confident in discharging their duties.
14. One of the views on responsibility of engineers is
 - a) They should do good work
 - b) They should take reasonable responsibility.
 - c) They should be strictly liable
 - d) They should be absolutely reliable.
15. One of the impediments to responsibility is
 - a) Self – deception
 - b) Rampant corruption at higher level
 - c) Interference by higher officers
 - d) Interference by politician.
16. This does not amount to misusing the truth
 - a) Deliberation deception
 - b) Biased professional information
 - c) Withholding information
 - d) Failure to seek – out in truth.
17. 'Tight couple' means
 - a) Strong adhesive materials
 - b) Process tightly coupled
 - c) Erecting two pillars side by side
 - d) Binding two beams tightly.
18. Which of the following is not preserved as an intellectual property?
 - a) Copyright
 - b) Government regulations
 - c) Trade secrets
 - d) Patents.
19. 'Acceptable Risk' means
 - a) Inevitable risk
 - b) Risk is natural part of the process
 - c) Risk of harm equal to probability of producing benefit
 - d) Risk which cannot be avoided.
20. An expert testimony does not demand
 - a) Adequate time for thorough investigation.
 - b) Consultancy extensively with the lawyer.
 - c) Expert legal knowledge.
 - d) Objective and unbiased demeanor.

21. What is morally wrong?
 - a) Can be legally right
 - b) Can be measured as constitutionally right
 - c) Cannot be measured as constitutionally right
 - d) Both (b) and (c).
22. Revealing confidential information means
 - a) Violation of patent right
 - b) Criminal breach of trust
 - c) Breach of contract
 - d) Misusing the truth.
23. The tendency of interpreting situations according to their views and imposing views is
 - a) Confined vision
 - b) Egocentric
 - c) Self interest
 - d) None of these
24. Which of the following is not advised by NSPE code to engineers?
 - a) To be honest
 - b) Not to use firms home in dishonest business
 - c) Not to avoid deceptive acts
 - d) To have professional obligations.
25. Which of the following qualities an ethically responsible engineer should not have with regard to risk?
 - a) Dishonest in assessing
 - b) Be aware of different approaches to the determination
 - c) Not be deceiving
 - d) Aware of difficulty.
26. Which of the following is not a democratic institution of the rigvedic era?
 - a) Samithi
 - b) Sabha
 - c) Grama
 - d) Thaluku
27. Which act created for the first "the Supreme Court"?
 - a) The Pitts India Act
 - b) The regulatory Act,1773
 - c) The amending Act
 - d) The Act of 1786.
28. Indian national congress started 'Quit India movement' after the failure of
 - a) Cripps mission
 - b) Sepoy Mutiny
 - c) August offer
 - d) Wavell plan
29. India borrowed the idea of incorporating fundamental rights in the constitution from
 - a) China
 - b) France
 - c) USA
 - d) UK
30. Which of the following is not a fundamental right?
 - a) Constitutional remedies
 - b) Property
 - c) Assemble peacefully
 - d) Move freely
31. Who is authorized to lay down qualifications to acquire the citizenship?
 - a) Parliament
 - b) President
 - c) Speaker
 - d) Prime Minister
32. Who quoted 'child of today is the citizen of tomorrow'?
 - a) Dr. B.R.Ambedkar
 - b) Gandhiji
 - c) Vallabhbhai Patel
 - d) Jawaharlal Nehru
33. Right to equality is guaranteed under the article
 - a) 13
 - b) 14
 - c) 15
 - d) 17
34. The directive principle of the state policy may be classified into
 - a) Socialist, Gandhian and liberal
 - b) Gandhian, liberal and communist
 - c) Socialist and communist
 - d) Liberal and communist
35. Which one of the following is a directive principle of the state policy?
 - a) The state shall not deny to any person equality before the law
 - b) The state shall endeavor to protect and improve the environment
 - c) The state shall not discriminate against any person on grounds of religion, race, caste, sex or place of birth
 - d) Untouchability is abolished and its practice in any form shall be punishable by law.

36. The directive principle of state policy
 a) can be enforced only by the Supreme Court b) can be enforced by the High Court
 c) can be enforced relating to SCs and STs only d) can not be enforced by any Court
37. The fundamental duties under the Indian constitution are provided
 a) an order of the President b) An amendment to the constitution
 c) A legislation by the Parliament d) An order by the Supreme Court
38. The fundamental duties demand to
 a) abide by moral rules b) avoid corruption
 c) work sincerely d) abide by the constitution
39. What is the main sanction behind the fundamental duties?
 a) Legal b) Social c) Moral d) All of these
40. Which one of the following are fundamental duties?
 a) To uphold and protect the sovereignty of India
 b) To protect and improve environment
 c) To safeguard the public property
 d) All of the above.
41. The concept of judicial review has been borrowed from the constitution of
 a) Switzerland b) UK c) USSR d) USA
42. The President of India is an integral part of the
 a) LS b) Union cabinet c) Parliament d) Union
43. The Chief Justice and other judges of the high court are appointed by the
 a) Chief Justice of India b) President
 c) Governor d) Chief Minister
44. Which article authorizes the President to seek an advice from the supreme court?
 a) 142 b) 124 c) 134 d) 143
45. Who appoints the Governor of the state?
 a) Chief Justice of India b) Chief Justice of state
 c) Chief Minister d) The President
46. The Governor of a state should
 a) be a member of LS b) not hold any other office of profit
 c) be resident of the state d) have completed the age 45 years
47. Who decide the number of the judges in the high court?
 a) President b) State Legislature c) Governor d) Parliament
48. Salaries and other emoluments of the high court judges shall be determined by the
 a) Governor b) Parliament c) Chief Minister d) State Legislature
49. In which year was 'untouchability' abolished, in India ?
 a) 1952 b) 1956 c) 1950 d) 1954
50. According to Marriage Act of 1954, the age is fixed at _____ years for men and _____ for women.
 a) 22 and 18 b) 24 and 20 c) 21 and 20 d) 21 and 18
