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First Semester B.E. Degree Examination, January 2011
Engineering Mathematics – I

Time: 3 hrs.

Max. Marks:100

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

- 1 a. Choose the correct answer :
- i) If $f(x)$ is continuous in $[a, b]$, differentiable in (a, b) and $f(a) = f(b)$, then there exists _____
 $C \in (a, b)$ such that $f'(c) = 0$.
 A) unique B) infinite C) at least one D) no such
- ii) The Maclaurin's series of $f(x) = k(\text{constant})$ is,
 A) $f(x) = k$ B) $f(x) = 0$ C) does not exist D) $f(x) = k!$
- iii) The n^{th} derivative of $\frac{1}{(x+2)^3}$ is
 A) $\frac{(-1)^n (n+2)!}{2!(x+2)^{n+3}}$ B) $\frac{1}{(x+2)^{n+3}}$ C) ZERO D) None of these.
- iv) The 12^{th} derivative of $y = e^{\sqrt{2}x} \sin \sqrt{2}x$ is
 A) $(64)y$ B) $-4096y$ C) $(32)y$ D) None of these. (04 Marks)
- b. If $x = \tan(\log y)$, prove that $(1+x^2)y_{n+1} + (2nx - 1)y_n + n(n-1)y_{n-1} = 0$ (06 Marks)
- c. Expand $\log(\sec x)$ by using the Maclaurin's series expansion up to the term containing x^4 . (05 Marks)
- d. State and prove the Lagrange's mean value theorem. (05 Marks)
- 2 a. Choose the correct answer :
- i) Which statement is true?
 A) $\frac{0}{0}, \frac{\infty}{\infty}, \infty - \infty, 0 \times \infty$ are not indeterminate B) $0^0, \infty^0$ are not indeterminate
 C) 1^∞ is not indeterminate D) None of these.
- ii) The angle between $r = a \sin \theta$ and $r = b \cos \theta$, is
 A) $\pi/2$ B) π C) $-\pi/2$ D) None of these.
- iii) The radius of a curvature in the polar form is,
 A) $\frac{[r^2 + r_1^2]^{3/2}}{r^2 + 2r_1^2 - rr_2}$ B) $\frac{[r_1^2 + r^2]^{3/2}}{r_1^2 + 2r^2 - rr_2}$ C) $\frac{[r^2 + r_1^2]^{3/2}}{r^2 + 2r_1 r_2 - rr_2}$ D) None of these.
- iv) $\lim_{x \rightarrow 0} \frac{2^x - 3^x}{5^x - 6^x}$ is ,
 A) $\frac{\log(2/3)}{\log(5/6)}$ B) $\log \left[\frac{2}{3} - \frac{5}{6} \right]$ C) $\log \left[\frac{2/3}{5/6} \right]$ D) None of these. (04 Marks)
- b. Evaluate : i) $\lim_{x \rightarrow 0} \frac{\sin x \sin^{-1} x}{x^2}$ ii) $\lim_{x \rightarrow 0} \left(\frac{2^x + 3^x + 4^x}{3} \right)^{1/x}$ (06 Marks)
- c. Derive an expression for the radius of curvature in the pedal form. (05 Marks)
- d. Find the radius of curvature of $a^2 y = x^3 - a^3$ at the point where the curve cuts x-axis. (05 Marks)

3 a. Choose the correct answer :

- i) If $u = ax^2 + by^2 + abxy$, then $\frac{\partial^3 u}{\partial x^2 \partial y}$ is
 A) Zero B) $a + b + ab$ C) ab D) None of these.
- ii) The Taylor's series of $f(x, y) = xy$ at $(1, 1)$ is
 A) $1 + [(x-1) + (y-1)]$ B) $1 + [(x-1) + (y-1)] + [(x-1)(y-1)]$
 C) $(x-1)(y-1)$ D) None of these.
- iii) The Jacobian of transformation from the Cartesian to polar coordinate system is,
 A) r^2 B) $r^2 \cos \theta$ C) $r^2 \sin \theta$ D) None of these.
- iv) If $u = f(x, y)$, $x = \phi(t)$, $y = \psi(t)$, then du/dt is,
 A) $\frac{du}{dx} \frac{dx}{dt} + \frac{du}{dy} \frac{dy}{dt}$ B) $\frac{dx}{dt} + \frac{dy}{dt}$ C) $\frac{\partial u}{\partial x} \frac{dx}{dt} + \frac{\partial u}{\partial y} \frac{dy}{dt}$ D) None of these.

(04 Marks)

b. If $\sin u = \frac{x^2 y^2}{x+y}$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3 \tan u$

(06 Marks)

c. If $u = \frac{xy}{z}$, $v = \frac{yz}{x}$ and $w = \frac{xz}{y}$, find $J = \frac{\partial(u, v, w)}{\partial(x, y, z)}$.

(05 Marks)

d. If the H.P. required by the steamer varies as the cube of the velocity and the square of the length, find the percentage change in H.P. for 3% and 4% increase in velocity and length respectively.

(05 Marks)

4 a. Choose the correct answer :

i) The gradient, divergence, curl are respectively

- A) scalar, scalar, vector B) vector, scalar, vector
 C) scalar, vector, vector D) vector, vector, scalar

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

- A) constant vector B) solenoidal vector C) scalar D) None of these.

iii) Curl grad f is,

- A) grad curl f B) curl grad $f + \text{grad curl } f$ C) zero D) does not exist.

iv) If the curvilinear system is spherical polar coordinate system then the radius vector R is

- A) $r \sin \theta \cos \phi \vec{i} + r \sin \theta \sin \phi \vec{j} + r \cos \theta \vec{k}$ B) $r \sin \theta \vec{i} + r \cos \theta \vec{j} + r \vec{k}$
 C) $\vec{i} + \vec{j} + \vec{k}$ D) None of these.

(04 Marks)

b. If $\phi = x^2 + y^2 + z^2$ and $\vec{F} = x^2 \vec{i} + y^2 \vec{j} + z^2 \vec{k}$, then find $\text{grad } \phi$, $\text{div } \vec{F}$, $\text{curl } \vec{F}$.

(06 Marks)

c. Prove that $\text{div Curl } F = \nabla \cdot \nabla \times F = 0$.

(05 Marks)

d. Prove that the cylindrical coordinate system is orthogonal.

(05 Marks)

PART - B

5 a. Choose the correct answer :

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

- A) $\frac{5 \times 3 \times 1}{11 \times 9 \times 7}$ B) $\frac{4 \times 2}{11 \times 9} \frac{\pi}{2}$ C) $\frac{2 \times 4 \times 2}{11 \times 9 \times 7}$ D) None of these.

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

- A) x-axis B) y-axis C) the line $y = x$ D) All of these

iii) Surface area of a solid of revolution of the curve $y = f(x)$, if rotated about x-axis, is:

- A) $\int_{x=a}^b 2\pi y \, dx$ B) $\int_{x=a}^b 2\pi x \, dy$ C) $\int_{x=a}^b 2\pi y \, ds$ D) $\int_{x=a}^b 2\pi x \, ds$

- iv) Asymptote to the curve $y^2(a-x) = x^3$ is
 A) $y = 0$ B) $x = 0$ C) $x = a$ D) None of these. (04 Marks)
- b. Evaluate $\int_0^1 \frac{x^\alpha - 1}{\log x} dx$, $\alpha \geq 0$. (06 Marks)
- c. Derive the reduction formula for $\int_0^{\pi/2} \sin^n x dx$. (05 Marks)
- d. Compute the perimeter of the cardioid $r = a(1 + \cos\theta)$. (05 Marks)
- 6 a. Choose the correct answer :
- i) For the differential equation $\left(\frac{d^3y}{dx^3}\right)^2 + \left(\frac{d^2y}{dx^2}\right)^6 + y = x^4$, the order and degree respectively are
 A) 2, 6 B) 3, 2 C) 2, 4 D) None of these.
- ii) $\frac{dy}{dx} + \frac{y}{x} = 0$ is
 A) Variable separable and homogeneous B) Linear
 C) Homogeneous and exact D) All of these.
- iii) $ydx - xdy = 0$ can be reduced to exact, if divided by
 A) $x^2 + y^2$ B) y^2 C) xy D) All of these.
- iv) Orthogonal trajectory of $y^2 = 4a(x+a)$ is
 A) $x^2 = 4a(y+a)$ B) $x^2 + y^2 = a^2$ C) Self orthogonal D) None of these. (04 Marks)
- b. Solve: $(1 + y^2)dx + (x - e^{-\tan^{-1}y})dy = 0$ (06 Marks)
- c. Solve: $(y^2e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$ (05 Marks)
- d. Find the orthogonal trajectory of the cardioids $r = a(1 - \cos\theta)$, using the differential equation method. (05 Marks)
- 7 a. Choose the correct answer :
- i) Which of the following is not an elementary transformation?
 A) Adding two rows B) Adding two columns
 C) Multiplying a row by a non-zero number D) Squaring all the elements of the matrix.
- ii) Rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ is
 A) 3 B) 1 C) 2 D) None of these.
- iii) The solution of the simultaneous equations $x + y = 0$, $x - 2y = 0$ is
 A) only trivial B) only unique C) unique and trivial D) None of these.
- iv) Which of the following is in the normal form?
 A) $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ B) $B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ C) $C = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ D) All of these. (04 Marks)

b. Find the rank of the matrix
$$\begin{bmatrix} 91 & 92 & 93 & 94 & 95 \\ 92 & 93 & 94 & 95 & 96 \\ 93 & 94 & 95 & 96 & 97 \\ 94 & 95 & 96 & 97 & 98 \\ 95 & 96 & 97 & 98 & 99 \end{bmatrix}$$
. (06 Marks)

c. For what values of λ and μ , the following simultaneous equations have i) No solution ii) a unique solution iii) an infinite number of solutions?

$$x + y + z = 6; \quad x + 2y + 3z = 10; \quad x + 2y + \lambda z = \mu. \quad (05 \text{ Marks})$$

d. Solve, using the Gauss-Jordan method.

$$x + y + z = 9; \quad x - 2y + 3z = 8; \quad 2x + y - z = 3. \quad (05 \text{ Marks})$$

8 a. Choose the correct answer :

i) The eigen values of the matrix A exist, if

A) A is a square matrix

B) A is singular matrix

C) A is any matrix

D) A is a null matrix.

ii) A square matrix A of order 'n' is similar to a square matrix B of the order 'n' if

A) $A = P^{-1}BP$

B) $AB = \text{Null matrix}$

C) $AB = \text{Unit matrix}$

D) None of these.

iii) Which of these is in quadratic form?

A) $x^2 + y^2 + z^2 - 2xy + yz - zx$

B) $x^3 + y^3 + z^2$

C) $(x - y + z)^2$

D) None of these.

iv) Quadratic form $(X'AX)$ is positive definite, if

A) All the eigen values of A are > 0

B) At least one eigen value of A is > 0

C) All eigen values ≥ 0 and at least one eigen value = 0

D) No such condition.

(04 Marks)

b. Find the eigen values and eigen vector corresponding to the largest eigen value of the matrix

$$A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$$

(06 Marks)

c. If $P = \begin{bmatrix} -1 & 1 & 1 \\ 0 & -1 & 2 \\ 1 & 1 & 1 \end{bmatrix}$ is a modal matrix of the matrix A in Q.No.8(b), and inverse of P is

$$P^{-1} = \begin{bmatrix} -3 & 0 & 3 \\ 2 & -2 & 2 \\ 1 & 2 & 1 \end{bmatrix}, \text{ then transform A in to diagonal form and hence find } A^4. \quad (05 \text{ Marks})$$

d. Find the nature of the quadratic forms for which corresponding eigen values of the corresponding matrices are given as

Matrix	Eigen values
A	2, 3, 4
B	-3, -4, -5
C	0, 3, 6
D	0, -3, -4
E	-2, 3, 4

(05 Marks)

- 3 a. Choose the correct answer :
- Caustic embrittlement in boilers is due to
 - Excess of Na_2CO_3
 - Excess of MgCl_2
 - Excess of CaSO_4
 - None of these.
 - The process of increasing the thickness of oxide layer on nonferrous metals, by electrolytic oxidation is called
 - Anodizing
 - Phosphating
 - Galvanizing
 - None of these.
 - Water line corrosion is an example of
 - Differential metal corrosion
 - Galvanic corrosion
 - Differential aeration corrosion
 - Stress corrosion.
 - Rusting of iron is a process of
 - Reduction
 - Oxidation
 - Passivation
 - None of these.
- b. What is corrosion? Explain the electrochemical theory of corrosion with reference to iron. (04 Marks)
- c. Why aluminium is anodized? Explain the process of anodizing. (06 Marks)
- d. What are metallic coatings? Explain the galvanizing process. (05 Marks)
- 4 a. Choose the correct answer :
- Addition of non participating electrolytes in an electroplating bath is to
 - Increase the plating rate
 - Increase the current density
 - Increase the conductivity
 - None of these.
 - In the electroplating process, the structure modifiers are added to
 - Reduce internal stress
 - Reduce passivation of anode
 - Increase metal ion concentration
 - None of these.
 - The process used to manufacture a double sided printed circuit board is
 - Electroless plating
 - Electroplating
 - Immersion plating
 - Phosphating.
 - Electroless plating process is possible only on
 - Catalytically active surface
 - Inactive surface
 - Any surface
 - None of these.
- b. What are the advantages of electroless plating over electroplating? Explain electroplating of chromium. (04 Marks)
- c. Explain the following factors that influence the nature of the electrodeposit : (06 Marks)
- pH of the electrolytic bath ; ii) temperature. (04 Marks)
- d. Explain the process of electroless plating of copper, with relevant reactions. (06 Marks)

PART - B

- 5 a. Choose the correct answer :
- Methyl tertiary butyl ether is added to the gasoline to
 - Increase the cetane number
 - Minimize the knocking
 - Increase the efficiency of diesel engine
 - All of these.
 - A reference mixture used to find the cetane number of diesel is
 - α - methyl naphthalene - Isooctane
 - n - Heptane - Isooctane
 - α - methyl naphthalene - Hexadecane
 - n - Heptane - pentane.
 - A tendency of knocking is high if gasoline contains
 - Straight chain hydrocarbons
 - Cycloparaffins
 - Aromatics
 - None of these.
 - Gasohol is a blend of gasoline with
 - Methanol
 - Propanol
 - Butanol
 - Ethanol.
- (04 Marks)

- b. On burning 0.96×10^{-3} kg of a solid fuel, in a bomb calorimeter, the temperature of 3.5 kg of water was increased by 2.7°C . Water equivalent of the calorimeter and latent heat of steam are 0.385 kg and 2455 kJ/kg, respectively. If the fuel contains 5% hydrogen, calculate its gross and net calorific values. (04 Marks)
- c. What are catalytic converters? Explain the working of catalytic converters. (06 Marks)
- d. What is knocking? Explain the mechanism involved. (06 Marks)
- 6 a. Choose the correct answer :
- In potentiometric measurements, platinum electrode is combined with

A) Glass electrode	B) Calomel electrode
C) Zinc electrode	D) None of these.
 - Colorimetric estimation is based on

A) Lambert's Beer's law	B) Ohm's law
C) Faraday's	D) None of these.
 - Conductivity of a solution is same as specific conductivity, when the cell constant of the conductivity cell is

A) Two	B) One	C) Zero	D) None of these.
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 - The indicator electrode used in the potentiometric measurements is

A) Glass electrode	B) Pt electrode
C) Ion selective electrode	D) Calomel electrode.

 (04 Marks)
- b. State the phase rule and explain the terms involved, with an example. (06 Marks)
- c. Discuss the phase diagram of the water system and explain application of phase rule to the water system. (06 Marks)
- d. What is flame photometry? Mention its applications in analytical chemistry. (04 Marks)
- 7 a. Choose the correct answer :
- Benzoyl peroxide is used as

A) Initiator	B) Propagator
C) Terminator	D) Chain transfer agent.
 - Addition polymerization is

A) Step polymerization	B) Chain polymerization
C) Self condensation	D) None of these.
 - Addition of a plasticizer to the polymer

A) Increases T_g	B) Decreases T_g
C) Decreases cross linking	D) None of these.
 - The commercial name of polymer polymethylmethacrylate is

A) Spandex	B) Acrilon	C) Plexiglass	D) Novolac.
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 (04 Marks)
- b. What are the various methods of moulding plastics? Explain injection moulding. (06 Marks)
- c. What are the deficiencies of natural rubber? Explain the vulcanization of rubber. (06 Marks)
- d. Describe the synthesis and applications of Kevlar fiber. (04 Marks)

- 8 a. Choose the correct answer :
- Secondary treatment of sewage is carried out to reduce
 - Organic load
 - Inorganic load
 - Destroy microorganisms
 - None of these.
 - In reverse osmosis the flow of solvent takes phase form
 - Dilute to concentrated side
 - Concentrated to dilute side
 - Solute to solvent side
 - None of these.
 - Temporary hardness of water is due to
 - Ca (HCO₃)₂
 - CaCl₂
 - CaSO₄
 - MgSO₄.
 - The method used for secondary treatment of sewage is
 - Activated sludge process
 - Ion - exchange
 - Reverse osmosis
 - Electro-dialysis
- b. What is desalination? Explain the desalination of water by electro-dialysis. (04 Marks)
- c. Explain the argentometric method of determination of chloride in water. Write the reactions involved. (05 Marks)
- d. 50 ml of sample of water consumed 15 ml 0.01 MEDTA, before boiling and 5 ml of the same EDTA, after boiling. Calculate the degree of total hardness, permanent hardness and temporary hardness. (06 Marks)
- (05 Marks)

- 2 b. State and explain Heisenberg's uncertainty principle. (04 Marks)
- c. Find the eigen value and eigen functions for an electron in one dimensional potential well of infinite height. (08 Marks)
- d. Estimate the time spent by an atom in the excited state during the excitation and de-excitation processes, when a spectral line of wavelength 546 nm and width 10^{-14} m is emitted. (04 Marks)
- 3 a. Choose your answers for the following :
- i) The mobility of electrons in a conductor is $4 \times 10^{-3} \text{ m}^2\text{V}^{-1}\text{s}^{-1}$. Then the drift velocity of the electron in the presence of applied electric field of strength 100 Vm^{-1} is
 A) 4 ms^{-1} B) 10 ms^{-1} C) 0.4 ms^{-1} D) 0.04 ms^{-1}
- ii) The classical value of molar specific heat of a conductor is
 A) $\frac{3}{2} R$ B) $\frac{1}{2} R$ C) $3 R$ D) $\frac{5}{2} R$
- iii) The Fermi energy of a metal at absolute zero temperature is proportional to
 A) $n^{1/3}$ B) $n^{3/2}$ C) $n^{2/3}$ D) n^2
 where 'n' is number of free electrons per unit volume.
- iv) At 50 K, the probability of finding an electron at Fermi energy is $\frac{1}{2}$. The probability of finding electron at the same energy level at 100 K is
 A) 1 B) zero C) $\frac{1}{4}$ D) $\frac{1}{2}$ (04 Marks)
- b. Obtain the expression for electrical conductivity on the basis of free electron theory of metals. (08 Marks)
- c. Explain Fermi energy and Fermi factor. (04 Marks)
- d. Calculate the probability of an electron occupying an energy level 0.02 eV above the Fermi level and 0.02 eV below the Fermi level at 200 K. (04 Marks)
- 4 a. Choose your answers for the following :
- i) Choose the correct relation :
 A) $E = \epsilon_0 (\epsilon_r - 1)P$ B) $D = \epsilon_0 (\epsilon_r - 1)E$ C) $P = \epsilon_0 (\epsilon_r - 1)E$ D) $\epsilon_r = \chi - 1$
- ii) Electronic polarization
 A) decreases with increase in temperature
 B) increases with temperature
 C) is independent of temperature
 D) may increase or decrease with temperature
- iii) Hysteresis loss occurs when the mag material is subjected to
 A) DC voltage B) AC voltage
 C) both AC and DC voltage D) none of these
- iv) The relative permeability for diamagnetic materials is
 A) slightly greater than one B) zero
 C) less than one D) very much greater than one (04 Marks)
- b. Obtain the expression for internal field in solids. (08 Marks)
- c. Distinguish between hard and soft magnetic materials. (05 Marks)
- d. Find the polarization produced in a crystal by an electric field of strength 500 Vmm^{-1} if it has a dielectric constant of 6. (03 Marks)

PART - B

- 5 a. Choose your answers for the following :
- Rate of induced absorption depends on
A) number of atoms in lower energy state B) the energy density
C) number of atoms in higher energy state D) both A and B.
 - In semiconductor laser the material used is
A) any semiconductor B) direct band gap semiconductor
C) indirect band gap semiconductor D) not a semiconductor.
 - The required condition to achieve laser action in a system is
A) state of population inversion B) existence of metastable state
C) a resonant cavity D) all the three
 - In recording the image on the photographic plate the reference beam and the object beam undergo _____ at the photographic plate.
A) diffraction B) reflection C) interference D) polarization
(04 Marks)
- b. Explain the construction and working of He-Ne laser, with the help of suitable diagrams. (08 Marks)
- c. Mention the applications of holography. (04 Marks)
- d. The average output power of laser source emitting a laser beam of wavelength 633 nm is 5 mW. Find the number of photons emitted per second by the laser source. (04 Marks)
- 6 a. Choose your answers for the following :
- The critical temperature of mercury is
A) 4.2 K B) 6.2 K C) 7.8 K D) 20 K
 - The temperature of a superconductor kept in a weak magnetic field is reduced below critical temperature, then
A) $R = 0 ; B \neq 0$ B) $R \neq 0 ; B = 0$ C) $R \neq 0 ; B \neq 0$ D) $R = 0 ; B = 0$
 - The numerical aperture of an optical fiber in air is 0.32. The numerical aperture in water ($n_0 = \frac{4}{5}$) is
A) 0.43 B) 0.24 C) 0.64 D) 0.96
 - Graded index fiber can be
A) single mode fiber only B) multimode fiber only
C) both single mode and multimode D) depends on the surrounding medium
(04 Marks)
- b. Define the terms : i) angle of acceptance ii) numerical aperture
iii) fractional index change iv) modes of propagation. (04 Marks)
- c. Explain BCS theory of superconductivity. Write a short note on Maglev vehicles. (08 Marks)
- d. The refractive indices of core and cladding are 1.50 and 1.48 respectively in an optical fiber. Find the numerical aperture and angle of acceptance. (04 Marks)
- 7 a. Choose your answers for the following :
- The relation for angles between axes of a triclinic crystal is
A) $\alpha = \beta = \gamma = 90^\circ$ B) $\alpha \neq \beta \neq \gamma = 90^\circ$ C) $\alpha \neq \beta \neq \gamma \neq 90^\circ$ D) $\alpha = \beta = \gamma \neq 90^\circ$
 - The coordination number for a face centered cubic lattice is
A) 12 B) 8 C) 6 D) 26
 - The packing factor of fcc structure is
A) 52% B) 68% C) 92% D) none of these
 - The Miller indices of the plane parallel to the x and y axes are
A) (1 0 0) B) (0 1 0) C) (0 0 1) D) (1 1 1)
(04 Marks)

- 7 b. Derive an expression for inter planar spacing in terms of Miller indices. (06 Marks)
 c. Define packing fraction. Calculate packing fraction for sc and bcc structures. (06 Marks)
 d. Inter planar distance for a crystal is 3 \AA and the glancing angle for second order spectrum was observed to be equal to $10^\circ 30'$. Find the wavelength of the X-rays used. (04 Marks)
- 8 a. Choose your answers for the following :
- In a carbon nano tube, the bond between the carbon atoms is
 A) metallic B) ionic C) hydrogen D) covalent
 - Fullerene is
 A) a sheet of carbon atoms rolled up into long tube
 B) sixty carbon atoms arranged in the shape of a football
 C) one dimensional array of atoms
 D) three dimensional array of atoms
 - Ultrasonic waves are sound waves having
 A) velocity greater than 330 ms^{-1} B) velocity lesser than 330 ms^{-1}
 C) frequency greater than 20000 Hz D) frequency less than 20000 Hz
 - The typical size of nano material is between
 A) $1 - 10 \text{ nm}$ B) $10 - 50 \text{ nm}$ C) $1 - 100 \text{ nm}$ D) $1 - 1000 \text{ nm}$
 (04 Marks)
- b. What are nano materials? Explain carbon nano tubes and their physical properties. Mention few applications of carbon nano tubes. (08 Marks)
- c. Explain the principle and method of nondestructive method of testing of material using ultrasonics. (08 Marks)

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10CCP13

First Semester B.E. Degree Examination, January 2011

Computer Concepts and 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

- 1 a. Choose your answers for the following :
- Which of these are also known as PDA s ?
 A) workstations B) mainframes C) handheld PC s D) super computer
 - Which is the most powerful type of computers?
 A) microcomputer B) minicomputer
 C) mainframe computer D) super computer
 - Which of the software is used for creating slide show?
 A) web design software B) word processing software
 C) Presentation software D) spread sheet software
 - Which of the following is not a type of mouse?
 A) infra-red mouse B) opto-mechanical mouse
 C) optical mouse D) wireless mouse
- b. Draw the basic structure of computer and explain in brief. (04 Marks)
 c. Explain the different types of printers. (06 Marks)
 (10 Marks)
- 2 a. Choose your answers for the following :
- The two types of storage available in host computer system are _____ and _____.
 A) primary and secondary B) RAM and ROM
 C) primary and hard disk D) none of these
 - An example of magnetic storage device is
 A) CD-ROM B) diskette C) DVD D) flash memory
 - What does the term SCSI stand for?
 A) small computer software interface B) small computer storage interface
 C) small computer system interface D) small computer standard interface
 - Acronym DOS stands for
 A) disk operating system B) driver operating system
 C) diskless operating system D) distributed operating system
- b. List and explain any four types of computer processing techniques. (04 Marks)
 c. Explain the types of networks, in brief. (10 Marks)
 (06 Marks)
- 3 a. Choose your answers for the following :
- Which of the following is not a data type?
 A) char B) float C) int D) logical
 - Symbols used in flow chart for decision making is :
 A) rectangle B) circle C) parallelogram D) diamond shape

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. iii) The tool used to convert a source program to a machine language is :
 A) compiler B) loader
 C) linker D) preprocessor
- iv) Which of the following is not a valid identifier?
 A) _option B) amount C) \$amount D) sales_amount (04 Marks)
- b. Explain the input and output statements, with examples. (08 Marks)
- c. Draw the structure of C-program and explain in brief. (08 Marks)
- 4 a. Choose your answers for the following :
- i) Which of the following is a unary expression?
 A) ++x B) --x C) -5 D) x = 4
- ii) _____ is used to determine the order in which different operations in complex expression are evaluated.
 A) predictivity B) infix evaluation C) associativity D) none of these
- iii) How will $a = (\text{int})32.2/(\text{int})4.3$ be evaluated?
 A) 32.3/4.3 B) 32.0/4.0 C) 32/4 D) none of these
- iv) Which is not an arithmetic operator?
 A) + B) - C) * D) & (04 Marks)
- b. Write C assignment statements for :
- i) $\text{Area} = \pi r^2 + 2\pi rh$ ii) $\text{Torque} = \frac{2m_1m_2}{m_1 + m_2} \cdot g$ iii) $\text{Side} = \sqrt{a^2 + b^2 - 2ab \cos(x)}$ (06 Marks)
- c. Write a C-program to convert degrees to radians accepting a value from user. (06 Marks)
- d. Explain the postfix and prefix expressions, with examples. (04 Marks)

PART - B

- 5 a. Choose your answers for the following :
- i) The default return type of a function is :
 A) void B) char C) int D) float
- ii) A variable declared in a function is called
 A) actual variable B) local variable C) formal variable D) global variable
- iii) The main () is a
 A) library function B) keyword
 C) user defined function D) none of these
- iv) Which of the following is not a part of function header?
 A) name B) parameter list C) return type D) title (04 Marks)
- b. Discuss the different methods of parameter passing to function, with examples. (10 Marks)
- c. Write a C - program to find GCD of two numbers. (06 Marks)
- 6 a. Choose your answers for the following :
- i) _____ is a way to implement a multiway selection in C.
 A) while do B) goto
 C) for D) switch case
- ii) Which of the following is not a comparator operator in C?
 A) < B) <= C) = D) >=

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First Semester B.E. Degree Examination, January 2011
Elements of Civil Engineering and Engineering Mechanics

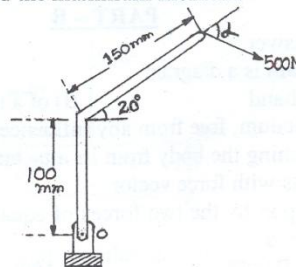
Time: 3 hrs.

Max. Marks:100

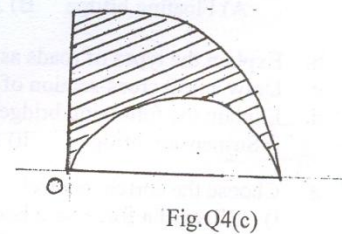
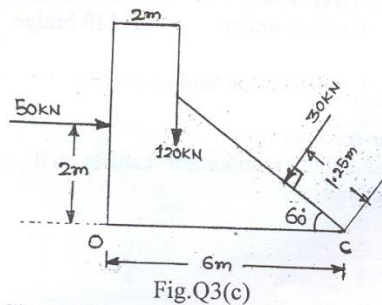
Note: 1. Answer any FIVE full questions, choosing at least two from each part.**2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.****3. Answer to objective type questions on sheets other than OMR will not be valued.****PART - A**

- 1 a. Choose the correct answer :
- Geotechnical engineering involves the study of
 A) Water B) Soil C) Air D) All of these.
 - Shoulders are the components of
 A) Roads B) Bridges C) Buildings D) Dams
 - A bridge constructed at some angle to the river flow is
 A) Skew bridge B) Square bridge C) Steel bridge D) Lift bridge
 - A bascule bridge is a
 A) Floating bridge B) Arch bridge C) Suspension bridge D) Movable bridge
 (04 Marks)
- b. Explain the types of roads as per the Nagpur-road plan. (06 Marks)
- c. Draw a neat cross-section of the gravity dam and mark important features on it. (04 Marks)
- d. Explain the following bridges, with neat sketches:
 i) Suspension bridge ii) Arch bridge (06 Marks)
- 2 a. Choose the correct answer :
- Effect of a force on a body depends in
 A) Magnitude B) Direction C) Position or line of action D) All of these.
 - When trying to turn a key into a lock, following is applied.
 A) Coplanar forces B) Moment C) Lever D) Couple.
 - A single force and a couple acting in the same plane upon a rigid body
 A) Balance each other B) Can not balance each other
 C) Produce moment of a couple D) One equivalent.
 - Moment of a force
 A) occurs about a point B) measures the capacity to do useful work
 C) occurs when bodies are in motion D) measures the ability to produce turning about axes
 (04 Marks)
- b. State the law of transmissibility of force. (02 Marks)
- c. Differentiate between the resultant and the equilibrant. (04 Marks)
- d. Determine the angle α for which the moment of the 500 N force shown in Fig.Q2(d), is maximum about 'O'. Also, find the maximum moment. (10 Marks)

Fig.Q2(d)



- 3 a. Choose the correct answer :
- Two forces each equal to $P/2$ act at right angles. Their effect may be neutralized by the third force, acting along their bisector in the opposite direction, with a magnitude of
 - P
 - $\sqrt{2}P$
 - $-P/2$
 - $P/\sqrt{2}$
 - In a coplanar concurrent forces system, if $\Sigma V = 0$, then the resultant is
 - Horizontal
 - Vertical
 - Moment
 - None of these
 - The Varignon's theorem is not applicable for the forces, which are
 - coplanar non-concurrent
 - non-coplanar, non-concurrent
 - concurrent
 - parallel.
 - The magnitude of the resultant of two forces of magnitudes P and $\sqrt{2}P$ is " P ". Then the angle between the two forces is
 - 135°
 - 90°
 - 45°
 - 30°
- b. The sum of the two concurrent forces P and Q is 500 N and their resultant is 400N. If the resultant is perpendicular to " P ", find P , Q and the angle between P and Q . (04 Marks)
- c. The forces acting on 1m length of a dam are shown in Fig.Q3(c). Determine the resultant force acting on the dam. Calculate the point of intersection of the resultant with the base. (10 Marks)



- 4 a. Choose the correct answer :
- The centre of gravity of a plane lamina will not be its geometrical centre if it is a
 - Square
 - Rectangle
 - Right angled triangle
 - Equilateral triangle
 - The centroid of an equilateral triangle of side ' a ' is ___ from any of the three sides,
 - $\frac{a\sqrt{3}}{2}$
 - $\frac{a\sqrt{2}}{3}$
 - $\frac{a}{2\sqrt{3}}$
 - $\frac{a}{3\sqrt{2}}$
 - The centroid of a semicircle of radius (r), with respect to its base is
 - $3r/3\pi$
 - $3r/8\pi$
 - $4r/3\pi$
 - $4r/\pi$.
 - Moment of the total area about its centroidal axis is
 - Twice the area
 - Three times the area
 - Zero
 - None of these. (04 Marks)
- b. Determine the centroid of a sector of radius r by the method of integration. (06 Marks)
- c. Find the centroid of the shaded area shown in Fig.Q4(c), obtained by cutting a semicircle of diameter 100mm from the quadrant of a circle of radius 100mm. (10 Marks)

PART - B

- 5 a. Choose the correct answer :
- A free body diagram is a diagram
 - drawn by free hand
 - of a body suspended freely in air
 - of a body in vacuum, free from any influence from the surroundings
 - drawn by detaching the body from its attachments with surroundings and replacing the attachments with force vector.
 - A particle acted upon by the two forces of equal magnitude is in equilibrium. The angle between the forces is
 - 0°
 - 90°
 - 180°
 - 45°

- iii) If a body is in equilibrium, it is concluded that
 A) no force is acting on the body B) the resultant of all the forces acting on it is zero
 C) the moment of the forces about any point is zero D) Both (B) and (C).
- iv) Three forces of magnitudes $F_1=100\text{N}$, $F_2=100\text{N}$ and $F_3=100\sqrt{3}\text{N}$ act on a particle in a plane. The particle remains in equilibrium, only if the angle between F_1 and F_2 is
 A) 30° B) 45° C) 60° D) 90° (04 Marks)
- b. A 3 kN crate is to be supported by a rope and pulley arrangements shown in Fig.Q5(b). Determine the magnitude and direction of the force 'F', which should be exerted at the free end of the rope. (06 Marks)

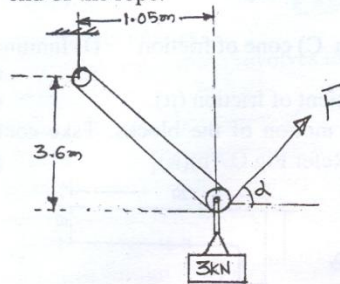


Fig.Q5(b)

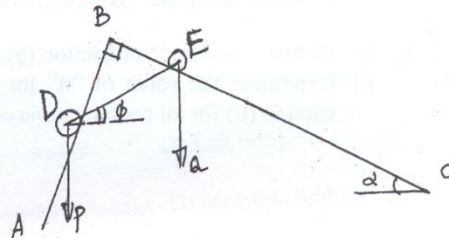


Fig.Q5(c)

- c. Two rollers of weights "P" and "Q" are connected by a flexible string DE and rest on two mutually perpendicular planes AB and BC as shown in Fig.Q5(c). Find the tension (T) in the string and angle " ϕ ", that it makes, with the horizontal, when system is in equilibrium. Given $P = 600\text{N}$, $Q = 1000\text{N}$, $\alpha = 30^\circ$. Assume that the string is inextensible and passes freely through the slots in the smooth inclined planes AB and BC. (10 Marks)
- 6 a. Choose the correct answer :
- i) Fixed beams have
 A) one end fixed & other end simply supported B) both ends fixed
 C) both ends roller supported D) one end fixed & other end free.
 - ii) GVL stands for
 A) General varying load B) Gradually vertical load
 C) Gradually varying load D) General variable load.
 - iii) A truss is perfect when
 A) $m = 2J - 3$ B) $2J = m + 3$ C) $m = 3J - 2$ D) $2J = m - 3$
 - iv) The minimum number of members to form a perfect truss is
 A) 1 B) 2 C) 3 D) 4 (04 Marks)
- b. Determine the reactions at the supports A and B, for the beam shown in Fig.Q6(b). (06 Marks)

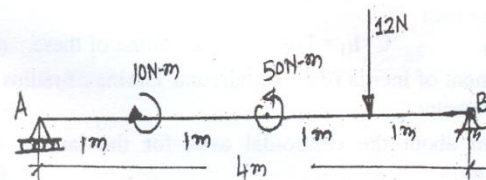


Fig.Q6(b)

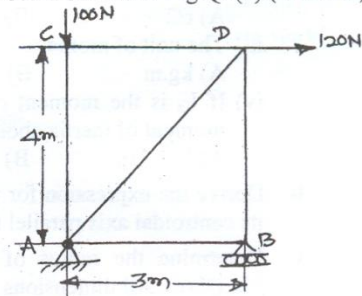


Fig.Q6(c)

- c. Find the support reactions and member forces for the pin-jointed plane truss shown in Fig.Q6(c), by method of joints. (10 Marks)

7 a. Choose the correct answer :

- i) The angle which an inclined surface makes with the horizontal, when a body placed on it is on the point of moving down, is known as,
 - A) angle of friction
 - B) angle of limiting friction
 - C) angle of inclination
 - D) angle of repose.
 - ii) If the angle of friction is zero, a body will experience
 - A) infinite friction
 - B) zero friction
 - C) the force of friction normal to the plane
 - D) the force of friction in the direction of motion.
 - iii) The coefficient of friction depends on
 - A) area of contact
 - B) shape of the surface
 - C) strength of the surface
 - D) All of these.
 - iv) The tangent of the angle of friction is of
 - A) angle of repose
 - B) coefficient of friction
 - C) cone of friction
 - D) limiting friction.
- b. i) Define : A) Angle of friction (ϕ), B) Coefficient of friction (μ). (04 Marks)
 ii) Determine the value of " θ " for impending motion of the blocks. Take coefficient of friction (μ) for all contact surfaces as 0.25. [Refer Fig.Q7(b)(ii)]. (02 Marks)
 iii) Determine the value of " θ " for impending motion of the blocks. Take coefficient of friction (μ) for all contact surfaces as 0.25. [Refer Fig.Q7(b)(ii)]. (06 Marks)

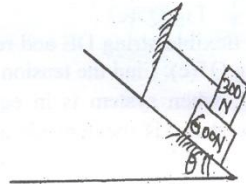


Fig.Q7(b)(ii)

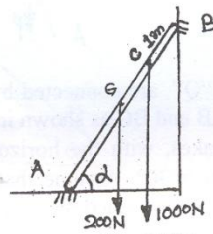


Fig.Q7(c)

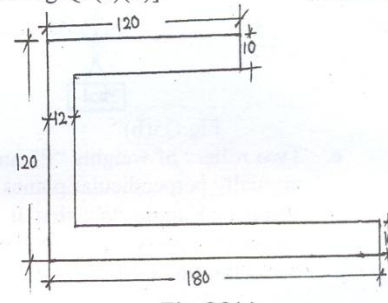


Fig.Q8(c)

- c. The ladder shown in Fig.Q7(c), is 4m long and is supported by a horizontal floor and vertical wall. The coefficient of friction at the wall is 0.25 and at the floor is 0.50. The weight of the ladder is 200 N, considered concentrated at "G". The ladder supports a vertical load of 1000N at "C". Determine the reactions at A and B and compute the least value of " α " at which, the ladder may be placed without slipping. (08 Marks)
- 8 a. Choose the correct answer :
- i) The ratio of the moment of inertia for triangle ($b \times h$) coinciding with its base to a centroidal axis parallel to the base is
 - A) $bh^3/2$
 - B) $bh^3/4$
 - C) $bh^3/8$
 - D) $bh^3/12$
 - ii) The radius of gyration of a circular area of radius " r " is
 - A) $r/2$
 - B) $r/4$
 - C) $2r/3$
 - D) $3r/4$
 - iii) The unit of moment of inertia of an area is
 - A) kg.m
 - B) kg.m^2
 - C) kg.m^4
 - D) m^4
 - iv) If I_G is the moment of inertia of a rectangle about its centroidal axis and I_{AB} is the moment of inertia about its base then
 - A) $I_G > I_{AB}$
 - B) $I_G < I_{AB}$
 - C) $I_G = I_{AB}$
 - D) None of these. (04 Marks)
- b. Derive the expression for the moment of inertia of a semicircular lamina of radius (r) about its centroidal axis parallel to the diameter. (04 Marks)
- c. Determine the radius of gyration about the centroidal axes for the lamina shown in Fig.Q8(c). All dimensions are in mm. (12 Marks)

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10EME14

First Semester B.E. Degree Examination, January 2011
Elements of Mechanical Engineering

Time: 3 hrs.

Max. Marks:100

- Note:** 1. Answer any FIVE full questions, choosing at least two from each part.
 2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.
 3. Answer to objective type questions on sheets other than OMR will not be valued.
 4. Use of steam tables is not permitted.

PART - A

- 1 a. Choose the correct answer :
- In which case, the potential energy is converted into the mechanical energy
 A) Hydel energy B) Solar energy C) Wind energy D) Nuclear energy
 - The flow of steam inside the boiler is regulated by
 A) Feed check valve B) Blow off cock C) Safety valve D) Stop valve.
 - Enthalpy of wet steam is determined by (with usual notations)
 A) $h_g = h_f + h_{fg}$ kJ/kg B) $h = h_f + x.h_{fg}$ kJ/kg
 C) $h_{sup} = h_g + c_{ps}(T_{sup} - T_s)$ kJ/kg D) $x = m_g / (m_f + m_g)$
 - Boiler accessories are fitted
 A) To measure steam properties B) To control steam inside the boiler
 C) To improve the efficiency of the boiler D) None of these. (04 Marks)
- b. With the help of simple line diagrams, show how solar energy, wind energy, hydel energy and tidal energy can be used as energy sources. (08 Marks)
- c. List the various boiler mountings and accessories. (03 Marks)
- d. Find the enthalpy of 1 kg of steam at 12 bar when steam is (i) dry saturated (ii) 22% wet and (iii) superheated to 250°C. Assume at 12 bar, steam has the following values: $T_s = 188^\circ\text{C}$, $h_f = 798.43$ kJ/kg, $h_{fg} = 1984.3$ kJ/kg, specific heat of the superheated steam is 2.25 kJ/kg. (05 Marks)
- 2 a. Choose the correct answer :
- The pipe which carries water from the reservoir to the turbine is called as
 A) Tailrace B) Penstock C) Headrace D) Surge tank
 - The pressure energy of steam is converted into the kinetic energy by
 A) Blades B) Rotor C) Nozzles D) Draft tube.
 - Method of reducing the rotor speed is known as
 A) Supercharging B) Retardation C) Governing D) Compounding
 - Flow of water through the runner, parallel to the axis of rotation of runner is known as
 A) Tangential flow B) Radial flow C) Axial flow D) Mixed flow. (04 Marks)
- b. Distinguish between the impulse and reaction turbines. (08 Marks)
- c. List the important parts of a Pelton wheel and explain their functions. (08 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.

- 3 a. Choose the correct answer :
- A connecting rod is a link between
 - Piston and the crankshaft
 - Piston and the flywheel
 - Cylinder and the flywheel
 - None of these.
 - A diesel engine is
 - spark ignition engine
 - compression ignition engine
 - external combustion engine
 - None of these.
 - The power developed inside the engine is called as
 - BHP
 - FHP
 - IHP
 - MEP
 - The function of a carburetor is to
 - provide air-fuel mixture
 - supply pure air
 - supply fuel only
 - cool the engine.
- (04 Marks)
- b. With the help of a line diagram, explain the working of a four stroke petrol engine. (08 Marks)
- c. The following observations were recorded during a test on a four stroke engine:
 Bore = 25cm ; Stroke = 40 cm ; Crank speed = 250 rpm;
 Net load on the brake drum = 700N ; Diameter of brake drum = 2m ;
 Indicated mean effective pressure = 6 bar.
 Determine : i) BP ii) IP iii) FP iv) Mechanical efficiency. (08 Marks)
- 4 a. Choose the correct answer :
- The chilling or freezing unit of a refrigerator is called as
 - Compressor
 - Evaporator
 - Condenser
 - Carburettor.
 - Ratio of heat removed from a cold body to the work input is known as
 - Ton of refrigeration
 - Coefficient of performance
 - Relative coefficient of performance
 - Refrigeration effect.
 - The function of an absorber is to
 - separate the vapour
 - raise the pressure of the vapour
 - absorb the refrigerant vapour
 - None of these.
 - One ton of refrigeration is equal to
 - 1.5 kW
 - 2.5 kW
 - 3.5 kW
 - 4.5 kW.
- (04 Marks)
- b. Explain the following terms:
- Refrigerant
 - Refrigerating effect
 - Ton of refrigeration
 - Coefficient of performance.
- (08 Marks)
- c. Distinguish between the vapour compression and vapour absorption refrigeration. (08 Marks)

PART – B

- 5 a. Choose the correct answer :
- Which part of the lathe is engaged for thread cutting operation?
 - Lead screw
 - Saddle
 - Cross slide
 - Apron
 - Enlarging the existing hole to the required diameter is done by
 - drilling
 - boring
 - knurling
 - turning
 - The tailstock setover is related to
 - thread cutting
 - plane turning
 - taper turning
 - knurling
 - The helical groove on the twist drill bit is called as
 - flank
 - shank
 - tang
 - flute.
- (04 Marks)
- b. With the help of a sketch, indicate the specifications of a lathe. (08 Marks)
- c. Sketch a radial drilling machine and explain its working. (08 Marks)

- 6 a. Choose the correct answer :
- The milling cutter is mounted on the
A) saddle B) arbor C) column D) knee
 - When the rotating cutter is fed against the advancing workpiece, it is called
A) slab milling B) angular milling C) climb milling D) upmilling
 - Removal of material by the mechanical action of abrasive particles is called
A) slot milling B) grinding C) reaming D) tapping.
 - Finishing the external cylindrical surface is carried out by
A) Lapping B) Honing C) Centreless grinding D) Angular milling. (04 Marks)
- b. Sketch the following operations:
i) Upmilling ii) Down milling iii) Slot milling iv) Surface grinding. (08 Marks)
- c. Explain the various abrasive materials used in the grinding operations. (04 Marks)
- d. List the important specifications of an universal milling machine. (04 Marks)
- 7 a. Choose the correct answer :
- Excess amount of acetylene is used for producing
A) Oxidizing flame B) Neutral flame C) Carburizing flame D) None of these.
 - The melting point of a filler material in brazing is
A) Below 100°C B) 150°C to 400°C C) 450°C to 900°C D) 1000°C to 3000°C
 - When the load is applied perpendicular to the axis of the shaft, the best choice to select
A) pivot bearing B) journal bearing C) bushed bearing D) thrust bearing
 - The temperature at which the lubricating oil will cease to flow is known as
A) pour point B) cloud point C) flash point D) fire point. (04 Marks)
- b. List the important properties of a good lubricant. (06 Marks)
- c. Sketch the full pressure lubrication system. (05 Marks)
- d. Explain the wick feed lubrication system. (05 Marks)
- 8 a. Choose the correct answer :
- Suggest a pulley when a machine needs to be stopped and started intermittently.
A) Stepped cone pulley B) Jockey pulley
C) Fast and loose pulley D) Guide pulley.
 - Sliding of belt between the pulley and the belt is called
A) creep B) slip C) tension D) pull.
 - The preferred drive, when the centre distance is short
A) Chain drive B) Belt drive C) Rope drive D) Gear drive
 - Drive used to convert a rotary motion into a linear motion is
A) helical gear B) bevel gear C) rack & pinion D) worm gear. (04 Marks)
- b. Sketch and explain :
- Open and cross belt drives ii) Stepped cone pulley. (08 Marks)
- c. Classify the various types of gear drives and mention their uses. (04 Marks)
- d. List the advantages of a V-belt over a flat belt. (04 Marks)

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10ELN15

First Semester B.E. Degree Examination, January 2011
Basic Electronics

Time: 3 hrs.

Max. Marks:100

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

- 1 a. Choose the correct answer :
- The rms value of a load current in case of a half wave rectifier is
 A) $\pi/2$ B) $I_m/2$ C) $I_m/\sqrt{2}$ D) I_m/π
 - The peak inverse voltage of a FWR, with centre tap transformer is
 A) V_m B) $4\sqrt{V_s}$ C) $2V_m$ D) $2V_s$
 - In a bridge rectifier, the input is from 230V, 50 Hz; the DC output voltage is
 A) 200V B) 207V C) 315V D) 220V
 - The knee voltage of a Germanium diode is _____ volts
 A) 0.3V B) 0.5V C) 0.7V D) None of these
 (04 Marks)
- b. Discuss the performance of the zener diode, in terms of the source & load effects. (08 Marks)
- c. Draw the circuit of a bridge rectifier and explain its working. What is the use of the filter? (08 Marks)
- 2 a. Choose the correct answer :
- The transistor operating point is along the _____.
 A) X-axis B) Resistance line C) Load line D) Y-axis
 - The _____ transistor is used for impedance matching.
 A) CB B) CE C) CC D) None of these.
 - The _____ transistor has the highest power gain.
 A) CE B) CC C) CB D) None of these.
 - In a transistor the current conduction is due to _____ carriers.
 A) Majority B) Minority C) Both A) and B) D) None of these.
 (04 Marks)
- b. Obtain the relation between the α_{dc} and β_{dc} . (04 Marks)
- c. Draw and explain the input and output characteristics of a PNP transistor in common emitter configuration. (08 Marks)
- d. Given $I_E = 2.5\text{mA}$, $\alpha = 0.98$ and $I_{CBO} = 10\mu\text{A}$, calculate I_B and I_C . (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.

- 3 a. Choose the correct answer :
- The reverse saturation current doubles for every _____ °C rise in temperature.
A) 40 B) 45 C) 10 D) 30
 - The intersection of DC load line and the output characteristics of a transistor is called
A) Q-point B) Quiescent point C) Operating point D) All of these.
 - For an emitter follower, the voltage gain is _____.
A) unity B) greater than unity C) less than unity D) zero.
 - The operating point must be _____ for the proper operation of the transistor.
A) High B) Stable C) Increasing D) Decreasing (04 Marks)
- b. Explain the circuit operation and analysis of voltage divider bias. (08 Marks)
- c. Design the collector to base bias circuit for Fig.Q3(c). Given $V_{CC} = 20V$, $V_{CE} = 5V$, $I_C = 6 \text{ mA}$, $h_{fc} = 100$. (04 Marks)

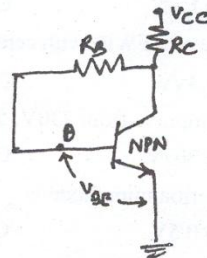


Fig.Q3(c)

- d. Explain the DC load line and operating point, with example, related to the transistor. (04 Marks)
- 4 a. Choose the correct answer :
- A SCR has _____ number of junctions.
A) one B) two C) three D) four
 - The FET is a _____ controlled device.
A) voltage B) current C) power D) None of these
 - The holding current in a SCR is _____ than the latching current.
A) more B) less C) equal D) None of these
 - A relaxation oscillator uses
A) MOSFET B) SCR C) UJT D) BJT (04 Marks)
- b. Sketch and explain the V-I characteristics of SCR. (04 Marks)
- c. Explain the P-channel JFET drain characteristics. (04 Marks)
- d. Explain the JFET as an amplifier. (08 Marks)

PART – B

- 5 a. Choose the correct answer :
- In a mid frequency band, the voltage gain is _____.
A) increasing B) decreasing C) constant D) None of these.
 - A crystal oscillator finds use, when the _____ stability is required.
A) amplitude B) frequency C) phase D) None of these.
 - The Colpitt's oscillator is _____.
A) Audio oscillator B) Radio oscillator C) Microwave oscillator D) None of these.
 - In an oscillator, we use _____ feedback.
A) positive B) negative C) unity gain D) None of these. (04 Marks)
- b. With the help of a neat circuit diagram, explain the function of every component in an RC coupled amplifier. (08 Marks)
- c. Draw and explain the RC phase shift oscillator. (04 Marks)
- d. Calculate the frequency of oscillations of a Hartley oscillator, having $L_1 = 0.5 \text{ mH}$, $L_2 = 1 \text{ mH}$ and $C = 0.2 \mu\text{F}$. (04 Marks)
- 6 a. Choose the correct answer :
- The op - Amp can amplify
A) AC signal only B) DC signal only C) Both AC and DC signals D) None of these.
 - An op Amp has _____ output impedance.
A) ∞ B) 0 C) $10,000 \Omega$ D) 600Ω
 - CMRR should be
A) unity B) zero C) much larger than unity D) much smaller than unity
 - The inverting amplifier circuit has $R_i = 1 \text{ k}\Omega$ and $R_f = 3 \text{ k}\Omega$. The output voltage is _____ when $v_i = 4\text{V}$.
A) 6V B) 16V C) 12V D) 18V (04 Marks)
- b. Explain the term op-Amp. List the characteristics of an ideal op-Amp. (08 Marks)
- c. Explain clearly how op-Amp can be used as the following type of amplifier:
i) summer ii) integrator iii) differentiator iv) inverting (08 Marks)
- 7 a. Choose the correct answer :
- The circuit that recovers the original modulating information from an AM signal is known as _____.
A) Modulator B) Mixer C) Demodulator D) Oscillator.
 - The binary equivalent of decimal number 6 is
A) 100 B) 011 C) 110 D) 1001

- iii) $(ABC)_{16} = (?)_{10}$
 A) 3000 B) 4230 C) 2748 D) 2250
- iv) $(11011)_2 = (?)_8$
 A) $(33)_8$ B) $(17)_8$ C) $(25)_8$ D) $(28)_8$ (04 Marks)
- b. Explain the need for modulation. (04 Marks)
- c. Draw the block diagram of super-heterodyne AM receiver. Explain the function of each block. (08 Marks)
- d. Write the decimal equivalent of $(10AB)_{16}$. (04 Marks)
- 8 a. Choose the correct answer :
- i) $A + AB =$ _____
 A) AB B) A C) B D) $1 + A$
- ii) The output is high only when both the inputs are zero to a gate. The gate is
 A) AND B) NOR C) OR D) NAND
- iii) The complement of $A+B+1$ is
 A) 0 B) $A+B+1$ C) $\overline{AB+1}$ D) 1
- iv) Universal gate is _____
 A) NOT B) AND C) OR D) NAND (04 Marks)
- b. Draw the full adder circuit, with the truth table. (08 Marks)
- c. Explain the logic circuit of XOR gate with the truth table. (04 Marks)
- d. Realize the following expression using the NOR gate.
 $Y = A (\overline{B} + C)$ (04 Marks)

- 2 d. A parallel circuit comprises of a resistor of 20 ohm in series with a inductive reactance of 15 ohm in one branch and a resistor of 30 ohm in series with a capacitive reactance of 20 ohm in the other branch. Determine the current and power dissipated in each branch of the circuit if the total current drawn by the parallel circuit is 10 $\sqrt{3}$ Amps. (06 Marks)
- 3 a. Choose your answers for the following :
- In a 3-phase system, the emfs are _____.
A) 30° apart B) 60° apart C) 90° apart D) 120° apart
 - The power taken by a 3-phase load is given by the expression _____.
A) $3 V_L I_L \cos \phi$ B) $\sqrt{3} V_L I_L \cos \phi$ C) $3 V_L I_L \sin \phi$ D) $\sqrt{3} V_L I_L \sin \phi$
 - In a 3-phase balanced delta system, the relation between the line voltage V_L and the phase voltage V_{ph} is _____.
A) $V_L = \frac{V_{ph}}{\sqrt{3}}$ B) $V_L = \sqrt{3} V_{ph}$ C) $V_L = V_{ph}$ D) none of these
 - When the two wattmeters used to measure a three-phase power, give equal readings, then the power factor of the circuit is _____.
A) 0.5 B) 0 C) 0.866 D) 1 (04 Marks)
- b. Obtain the relationship between the phase and line values of voltages and currents in a balanced star connected system. (08 Marks)
- c. A balanced three phase star connected system draws power from 440 V supply. The two wattmeters connected indicate $W_1 = 5$ KW and $W_2 = 1.2$ KW. Calculate power, power factor and current in the circuit. (08 Marks)
- 4 a. Choose your answers for the following :
- The dynamometer type wattmeter is used to measure _____.
A) only D.C. power B) only A.C. power
C) both A.C. and D.C. power D) both active and reactive power
 - In the energy meter, constant speed of rotation of the disc is provided by _____.
A) shunt magnet B) series magnet C) braking magnet D) none of these
 - A fuse is a _____.
A) current limiting device B) protective device
C) voltage limiting device D) none of these
 - A good earthing should provide _____ resistance in earthing path.
A) low B) high C) medium D) none of these (04 Marks)
- b. With a neat diagram, explain the working of dynamometer type wattmeter. (08 Marks)
- c. What is the necessity of earthing? With a neat diagram, explain the pipe earthing. (08 Marks)

PART - B

- 5 a. Choose your answers for the following :
- The emf generated by a given D.C. generator depends upon _____.
A) flux only B) speed only
C) flux and speed D) terminal voltage
 - For a 'P' pole lap wound armature of D.C. machine, the number of parallel paths are equal to _____.
A) 2 B) 2P C) P D) P/2

- 5 a. iii) A commutator is made up of _____.
A) iron lamination B) copper segments
C) both iron and copper segments D) none of these
- iv) The function of a starter in a D.C. motor is to _____.
A) control its speed B) increase its starting torque
C) limit the starting current to safe value D) none of these (04 Marks)
- b. A 4 pole, 1500 rpm d.c. generator has a lap wound armature having 24 slots with 10 conductors per slot. If the flux per pole is 0.04 Wb, calculate the emf generated in the armature. What would be the generated emf if the winding is wave connected? (06 Marks)
- c. What is back emf in a D.C. motor? What is its significance? (05 Marks)
- d. Derive an expression for armature torque in a D.C. motor. (05 Marks)
- 6 a. Choose your answers for the following :
- i) The core of the transformer is laminated to reduce _____.
A) eddy current loss B) hysteresis loss C) copper loss D) friction loss
- ii) The copper loss of a certain transformer at half full load is 200 W. Then the copper loss at full load will be _____.
A) 100 W B) 200 W C) 400 W D) 800 W
- iii) Losses which do not occur in a transformer are _____.
A) copper losses B) magnetic losses C) friction losses D) none of these
- iv) A transformer steps up the voltage by a factor of 100. The ratio of current in the primary to that in the secondary is _____.
A) 1 B) 100 C) 0.01 D) 0.1 (04 Marks)
- b. What are the losses occurring in a transformer? How do they vary with load? How they can be minimized? (08 Marks)
- c. Define the voltage regulation of a transformer. What is its importance? (04 Marks)
- d. A 40 KVA single phase transformer has core loss of 450 W and full load copper loss of 850 W. If the power factor of the load is 0.8, calculate :
- i) Full load efficiency
- ii) Load corresponding to maximum efficiency
- iii) Maximum efficiency at unity power factor. (04 Marks)
- 7 a. Choose your answers for the following :
- i) A salient pole field construction is used for alternator having _____.
A) low and medium speed B) large speed
C) very large speed D) none of these
- ii) A 4 pole, 1200 rpm alternator generates emf at a frequency of _____.
A) 25 Hz B) 40 Hz C) 50 Hz D) 60 Hz
- iii) For full pitch coil, the pitch factor K_p is _____.
A) 1 B) greater than 1 C) less than 1 D) none of these
- iv) The number of cycles generated in a 4 pole alternator in one revolution is _____.
A) 2 B) 4 C) 6 D) 50 (04 Marks)
- b. With neat diagram, explain the constructional features of a 3-phase alternator. (08 Marks)
- c. A 6 pole, 3-phase star connected alternator has 90 slots and 8 conductors per slot and rotates at 1000 rpm. The flux per pole is 50 milli wb. Find the induced emf across its line. Take $K_d = 0.97$ and $K_C = 0.96$. (08 Marks)

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Question Paper Version : A

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

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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

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1. The term ecosystem was introduced by
a) Haeckel b) Odum c) Tansley d) All of these
 2. The short term properties of the atmosphere at a given place and time are referred as
a) Climate b) Season c) Micro climate d) None of these
 3. Source of supply is called
a) Resources b) A means of meeting needs
c) Substance available d) Natural substance
 4. A major nitrogen storage reservoir is
a) River b) Atmosphere c) Oceans d) Trees
 5. The part of the earth in which life exists is known as
a) Lithosphere b) Biosphere c) Atmosphere d) Ionosphere
 6. Environment means
a) A beautiful landscape b) Industrial Production
c) Sum total of all condition d) Air and water
 7. The UN general assembly proclaimed the universal declaration of human rights in Paris in the year :
a) 1948 b) 1992 c) 1972 d) 1962

8. The leader of the Chipko movement is :
 a) Ambritha Devi b) Jashibhai Patel c) Medha Patekar d) Vandhan Shiva
9. World earth day is :
 a) 7th April b) 5th June c) 16th September d) 22nd April
10. Ecosystem has the following major components :
 a) Plants, animals and micro organisms b) Flora and Fauna
 c) Producers, consumers and decomposers d) Both a and c
11. Which of the following is a green house gas?
 a) Oxygen b) SO₂ c) Chlorofluorocarbons d) All of these
12. Taj Mahal at Agra may be damaged by
 a) CO₂ b) Chlorine c) Hydrogen d) None of these
13. Troposphere has an altitude range of
 a) 11 – 50 km b) 0 – 11 km c) 20 – 80 km d) 80 – 200 km
14. Taungya system is
 a) Agro forestry b) Inexhaustible c) Exhaustible d) Mining
15. Lithosphere means
 a) Air b) Water c) Micro organism d) Rocks and soil
16. How much percentage of land is covered with forest?
 a) 26% b) 19% c) 23% d) 25%
17. Human resource is a
 a) Renewable b) Inexhaustible c) All of these d) None of these
18. Excess fluoride in drinking water is likely to cause :
 a) Blue babies b) Fluorosis c) Taste and odour d) Irritation
19. Which among the following is a climatic factor?
 a) Pressure b) Humidity c) Temperature d) All of these
20. The basic requirements of human beings are provided by
 a) Industrialization b) Agriculture c) Development d) Urbanization
21. The word “ecology” is derived from
 a) Greek b) French c) Spanish d) English
22. Hydrological cycle mainly involves
 a) Air and water b) Sun and water
 c) Animal and water d) Mountain and water
23. The forest is
 a) Abiotic b) Biotic c) Both a and b d) None of these
24. Most biotic resources are
 a) Non renewable b) Renewable c) Jhum d) None of these

25. Store house of minerals and nutrients is :
a) Soil b) Water c) Forest d) All of these
26. The word "environment" is derived from
a) Greek b) French c) Spanish d) English
27. Abiotic components include the
a) Climate and edaphic factors b) Climate factor
c) Edaphic factor d) None of these
28. Natural ecosystem is called
a) Anthropogenic b) Human activity c) Both a and b d) None of these
29. Hydrosphere denotes
a) Water b) Plants c) Microorganisms d) Soil
30. Both power and manure is provided by
a) Nuclear plants b) Thermal Plants
c) Biogas plants d) Hydroelectric plants
31. World AIDS day is :
a) 1st July b) 5th June c) 1st December d) 2nd October
32. Study trends in human population growth and prediction of future growth is called
a) Demography b) Biography c) Kalogrpahy d) Psychology
33. Name the species to which human belongs
a) Animals b) Plants c) Homosapiens d) All of these
34. What was the human population at the beginning of the 20th century?
a) 1.2 billion b) 1.6 billion c) 1.8 billion d) 2.0 billion
35. Ozone hole is
a) Antarctica b) Kautilya c) Earth summit d) All of these
36. Green house effect is related to
a) Green trees b) CO₂
c) Chlorofluorocarbons d) Methane
37. Expand WWF
a) World Wide Life Fund b) World Wide Forest
c) Both a and b d) None of these
38. Decomposers are
a) Bacteria and Fungi b) Reducers c) Both a and b d) None of these
39. Large regional unit characterized by Flora and Fauna is
a) Biosphere b) Biome c) Ecosystem d) All of these
40. One of the inexhaustible resources is
a) Minerals b) Fossil fuels c) Solar energy d) None of these

41. A distinct unit of life in nature is :
a) Population b) Ecosystem c) Organisms d) Landscape
42. Name of the scientist who gave the difference between Niche and Habitat, is :
a) Odum b) Ernest Haeckel c) Grinnell d) Both a and c
43. Construction of dams has
a) Only merits b) Only demerits
c) Neither merits nor demerits d) Merits as well as demerits
44. The sequence of eating and being eaten in an ecosystem is called
a) Food chain b) Hydrological cycle c) Carbon cycle d) Anthropogenic
45. B.O.D. measures
a) Industrial pollution
b) Air pollution
c) Polluting capacity of effluents
d) D.O. needed by microbes for decomposition
46. What is the unit of measurement of sound?
a) dB b) Decibel c) Both a and b d) None of these
47. What is the percentage oxygen present in air?
a) 78.08% b) 21% c) 71% d) 73%
48. Weather conditions determine
a) Wind b) Temperature c) Organisms d) All of these
49. Soil conservation is a process in which
a) Soil is aerated b) Soil erosion is allowed
c) Sterile soil is made fertile d) Soil is protected against loss
50. Expand E.I.A.
a) Environmental Protection Act b) Environmental Impact Assessment
c) Environmental Impact Administration d) All of these

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Question Paper Version : D

**First Semester B.E. Degree Examination, January 2011
Constitution of India and Professional Ethics**

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 "Whatever develops our moral virtues is ethical" is the principle of

a) Justice approach	b) Right approach
c) Utilitarian approach	d) Virtual approach.
 - 2 Intentionally causing harm is related to

a) Legal responsibility	b) Moral responsibility
c) Both (a) and (b)	d) None of these.
 - 3 NSPE denotes

a) National scheme for professional ethics.	b) National society for professional engineers.
c) National sectorwise programme efficiency.	d) National scheme for professional engineers.
 - 4 'Retaining only those results that fit the theory and discarding others' is

a) Cooking	b) Trimming	c) Forging	d) Plagiarism.
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 - 5 The diagram of the possible ways in which, an accident occurs is represented by

a) Blue print	b) Fault tree	c) Flow chart	d) None of these.
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 - 6 Vicarious liability is

a) A person held liable for actions committed by him.	b) A person held liable for actions not committed by him.
c) Both (a) and (b)	d) None of these.

- 7 'Not settling for less than what you deserve' is
a) Honesty b) Dharma c) Integrity d) Eligibility.
- 8 Jingle associated products represent
a) Trademark b) Copyright c) Patent right d) Trade secret.
- 9 A girl can marry only after attaining this age
a) 16 b) 20 c) 18 d) 21.
- 10 Election commission of India is
a) One member commission b) Two member commission
c) Multimember commission d) None of these.
- 11 The source of authority of the Indian constitution is
a) The Government b) The Supreme Court
c) The people of India d) The President
- 12 The credit of developing the preamble of the constitution goes to
a) Mahatma Gandhi b) Pandit Nehru
c) B.R. Ambedkar d) Sardar Patel
- 13 This could be a ground for reservation of posts
a) Language b) Colour c) Residence d) Family base.
- 14 Right to property is a
a) Fundamental right b) Legal right c) Moral right d) Ordinary right.
- 15 Double jeopardy means
a) No prosecution and punishment for the same offence more than once.
b) There can be prosecution and punishment for the same offence more than once.
c) Double benefit.
d) Same punishment for twin offences.
- 16 The first right under article 22 is
a) Right to consult accused persons' own lawyer.
b) Right to be produced before a magistrate.
c) Right to be informed of ground of arrest.
d) Right to converse with family members.
- 17 This is the custodian of fundamental rights
a) Civil court b) Supreme court
c) State Government d) Central Government.
- 18 Mandamus writ lies against
a) Public authority b) Private person
c) Erring politicians d) Erring social workers
- 19 Right to education is contained in article
a) 20 b) 21 (A) c) 21 (S) d) 21.
- 20 Constitution of this country is the oldest and the shortest :
a) UK b) Russia c) Germany d) USA.

