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10MAT11

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

1

Time: 3 hrs.

Max. Marks: 100

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

PART – A

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

i) If $y = x^{2n}$, y_{n+1} is equal to _____

- A) zero B) $\frac{n!}{(2n)!} x^n$ C) $\frac{2n!}{(n-1)!} x^{n-1}$ D) $\frac{2n!}{(n-1)!} x^{n-1}$

ii) If $y = x^n \log x$ then by Leibnitz theorem $xy_{n+1} =$ _____

- A) $(n-1)!$ B) $(n+1)!$ C) $n!$ D) 0

iii) If $f(x) = \sqrt{x}$, $g(x) = \frac{1}{\sqrt{x}}$ then by Cauchy's mean value theorem $C =$ _____

- A) $\sqrt{a-b}$ B) $\sqrt{a+b}$ C) $\sqrt{ab}$ D) $\frac{a}{b}$

iv) By Maclaurin's series $1 + x + \frac{x^2}{2} + \frac{x^3}{3} + \dots$ is equal to,

- A) e^x B) $\sin x$ C) $\cos x$ D) $\log(1+x)$

b. If $y = \log(x + \sqrt{1+x^2})$ Prove that $(1+x^2)y_{n+2} + (2n+1)xy_{n+1} + n^2y_n = 0$ (04 Marks)

c. State Lagrange's mean value theorem, and find the number 'C' in $[0, 4]$ when $f(x) = (x-1)(x-2)(x-3)$. (06 Marks)

d. Expand $\log_e x$ in the powers of $x-1$ and hence evaluate $\log_e(1.1)$ by taking upto 4th degree terms. (06 Marks)

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

i) $\lim_{x \rightarrow \frac{\pi}{2}} (\sec x - \tan x) =$ _____

- A) 0 B) 1 C) $\pi/2$ D) π

ii) The angle between radius vector and the tangent to the curve $r = \sin \theta + \cos \theta$ is _____

- A) $\frac{\pi}{4} - \theta$ B) $\frac{\pi}{4} + \theta$ C) $\frac{\pi}{2} + \frac{\theta}{2}$ D) $\frac{\pi}{2} - \frac{\theta}{2}$

iii) The derivative of arc length for the curve $x = f(y)$ is _____

- A) $\sqrt{1+y_1^2}$ B) $\sqrt{x_1^2+y_1^2}$ C) $\sqrt{1+x_1^2}$ D) $\sqrt{1-y_1^2}$

iv) The radius of curvature of the curve $2ap^2 = r^3$ is _____

- A) $\frac{3}{2}\sqrt{2ar}$ B) $\frac{3}{2}\sqrt{ar}$ C) $\frac{2}{3}\sqrt{ar}$ D) $\frac{4aP}{3r}$

b. Evaluate $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} - \frac{1}{\sin^2 x} \right)$. (04 Marks)

c. Find the angle of intersection between the curves $r^2 \sin 2\theta = 4$ and $r^2 \operatorname{cosec} 2\theta = 16$. (06 Marks)

d. Find the radius of curvature at any point t on the curve $x = a \left(\cos t + \log \tan \frac{t}{2} \right)$, $y = a \sin t$ (06 Marks)

3 a. Choose the correct answers for the following :

(04 Marks)

- i) If $u = x^2 + y^2 + z^2$ then $\frac{\partial u}{\partial x} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^3 u}{\partial t^3} =$ _____
 A) $2(x + y)$ B) $2(x + 1)$ C) $2(x + z)$ D) $2(y + z)$
- ii) For $u = x(1 - y)$, $V = xy$ the value of Jacobian is,
 A) x B) x^2 C) xy D) $\frac{x}{y}$
- iii) In the Taylor's expansion of $f(x, y) = xy^2 + \cos(xy)$ about $(1, \pi/2)$ the value of the derivative $\frac{\partial^2 f}{\partial x \partial y}$ at the given point is _____,
 A) $\pi + 1$ B) $\pi + 2$ C) $\pi - 1$ D) $\pi - 2$
- iv) For $f(x, y) = x^3 y^2 (1 - x - y)$, one set of stationary values are,
 A) $\left(\frac{1}{2}, \frac{1}{2}\right)$ B) $\left(\frac{1}{3}, \frac{1}{3}\right)$ C) $\left(\frac{1}{3}, \frac{1}{4}\right)$ D) $\left(\frac{1}{2}, \frac{1}{3}\right)$

- b. If $u = f(y - z, z - x, x - y)$, find the value of $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$ (04 Marks)
- c. If $u = x + y + z$, $uv = y + z$, $uvw = z$ then find the value of $\frac{\partial(x, y, z)}{\partial(u, v, w)}$. (06 Marks)
- d. A rectangular box open at the top is to have a volume of 32 cubic units, find the dimensions of the box requiring least material for its construction. (06 Marks)

4 a. Choose the correct answers for the following :

(04 Marks)

- i) The representation $i \frac{\partial f}{\partial x} + j \frac{\partial f}{\partial y} + k \frac{\partial f}{\partial z}$ is for _____,
 A) $\nabla \cdot f$ B) $\nabla \times f$ C) $\nabla^2 f$ D) ∇f
- ii) If $\text{div } V = 0$ when V is the volume then such a point of function is called _____
 A) Rotational B) Irrotational C) Solenoidal D) Orthogonal
- iii) $\text{curl}(\text{grad } \phi)$ is denoted by,
 A) $\nabla \cdot (\nabla \phi)$ B) $\nabla \times (\nabla \cdot \phi)$ C) $\nabla \times (\nabla \phi)$ D) $\nabla \cdot (\nabla \cdot \phi)$
- iv) If $\hat{e}_1, \hat{e}_2, \hat{e}_3$ are the base vectors then the positive numbers h_1, h_2, h_3 are called the,
 A) volume factors B) scale factors C) area factors D) acceleration factors
- b. A vector field is given by, $\vec{F} = (x^2 - y^2 + x)i - (2xy + y)j$, show that the field is irrotational. (04 Marks)
- c. Prove that $\text{div}(\text{curl } A) = 0$. (06 Marks)
- d. Prove that cylindrical coordinate system is orthogonal. (06 Marks)

PART - B

5 a. Choose the correct answers for the following :

(04 Marks)

- i) If $I(\alpha) = \int_0^1 \frac{x^\alpha - 1}{\log x} dx$ then $\frac{dI(\alpha)}{d\alpha} =$ _____
 A) $\frac{1}{1 - \alpha}$ B) $\frac{1}{1 + \alpha}$ C) $\frac{1}{1 + \alpha^2}$ D) $\frac{1}{1 - \alpha^2}$

ii) The value of $\int_0^{\pi} \sin^4 x dx =$ _____

A) $\frac{3\pi}{8}$

B) $\frac{4\pi}{5}$

C) $\frac{5\pi}{8}$

D) $\frac{6\pi}{7}$

iii) The volume generated by revolving $y = f(x)$ between $x = a$ and $x = b$ is $V =$ _____

A) $\int_a^b y^2 dx$

B) $\int_a^b \pi y dx$

C) $\int_a^b \pi y^2 dx$

D) $\int_a^b \pi x^2 dx$

iv) Special points on x and y axes are _____ for the curve $x^{2/3} + y^{2/3} = a^{2/3}$

A) $\pi a^2 b$

B) πab^2

C) $\pi a^2 b^2$

D) πab

b. Evaluate $\int_0^{\infty} \frac{\tan^{-1} ax}{x(1+x^2)} dx$ using differentiation under integral sign. (04 Marks)

c. Evaluate $\int_0^{2a} x^2 \sqrt{2ax - x^2} dx$. (06 Marks)

d. Find the entire length of the curve $x^{2/3} + y^{2/3} = a^{2/3}$. (06 Marks)

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

i) Solution of $(2x+1) + (2y+1) \frac{dy}{dx} = 0$ is _____

A) $x^2 + y^2 + x + y = C$

B) $2x^2 + 2y^2 + x + y = C$

C) $\frac{x^2}{2} + \frac{y^2}{2} + x + y = C$

D) $x^2 + y^2 + 2x + 2y = C$

ii) For the linear differential equation $\frac{dx}{dy} + P(y)x = Q(y)$ the integrating factor is _____

A) $e^{\int P(x) dx}$

B) $e^{\int P(y) dy}$

C) $e^{\int P(y) dy}$

D) $e^{\int Q(y) dy}$

iii) In the exact differential equation, choosing $\frac{1}{M} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ denotes,

A) function of x alone

B) function of y alone

C) function of x and y

D) function of $\frac{x}{y}$

iv) In the orthogonal trajectory of $r = f(\theta)$ we replace $\frac{dr}{d\theta}$ by _____

A) $-r \frac{dr}{d\theta}$

B) $-r^2 \frac{d^2\theta}{dr^2}$

C) $-r \frac{d\theta}{dr}$

D) $-r^2 \frac{d\theta}{dr}$

b. Solve $(x+2y)(dx-dy) = dx+dy$. (04 Marks)

c. Solve $(x^2 + y^3 + 6x)dx + y^2 x dy = 0$. (06 Marks)

d. Find the orthogonal trajectories of the curve $r = 4a \sec \theta \tan \theta$ with a as the parameter. (06 Marks)

- 7 a. Choose the correct answers for the following : (04 Marks)
- i) If the elements in a square matrix below the main diagonal are zero then it is called _____.
 A) Orthogonal matrix B) Singular matrix
 C) Lower triangular matrix D) Upper triangular matrix
- ii) The rank of the matrix $A = \begin{bmatrix} 1 & 3 & -2 \\ 2 & -1 & 4 \\ 1 & -11 & 14 \end{bmatrix}$ is _____.
 A) 0 B) 1 C) 2 D) 3
- iii) The system of equations are said to be consistent when,
 A) $R(A) \neq R(A : B)$ B) $R(A) = R(A : B)$ C) $R(A) < R(A : B)$ D) $R(A) > R(A : B)$
- iv) In Gauss Jordan method the coefficient matrix is reduced to _____.
 A) diagonal matrix B) Upper triangular matrix
 C) null matrix D) non diagonal matrix
- b. Test for consistency and solve the system of equations $x + 2y + 2z = 5$, $2x + y + 3z = 6$, $3x - y + 2z = 4$ and $x + y + z = -1$. (04 Marks)
- c. Find the rank of the matrix $A = \begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & -1 & -1 \end{bmatrix}$. (06 Marks)
- d. Solve the system of equations by Gauss-Jordan method. $x + y + z = 9$, $x - 2y + 3z = 8$ and $2x + y - z = 3$. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- i) The Eigen values of the matrix $A = \begin{bmatrix} -3 & 8 \\ -2 & 7 \end{bmatrix}$ are _____.
 A) 5, -1 B) 5, 1 C) 5, 2 D) 5, -2
- ii) A square matrix A of order n is called similar to a square matrix A of order n if $A =$ _____.
 A) $PA^{-1}P^1$ B) $P^{-1}AP$ C) $P^{-1}A^1P$ D) PA^1P^1
- iii) A homogeneous expression of second degree in any number of variables is called a _____.
 A) Orthogonal form B) diagonal form C) triangular form D) quadratic form
- iv) If the eigen vector is (1, 1, 1) then its normalized form is _____.
 A) $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$ B) $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}\right)$ C) (1, 1, 1) D) $(\sqrt{3}, \sqrt{3}, \sqrt{3})$
- b. Find the eigen values and the eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. (04 Marks)
- c. Reduce the quadratic form, $3x^2 + 5y^2 + 3z^2 - 2xy + 2zx - 2xy$ to the canonical form, specify the matrix of transformation. (06 Marks)
- d. Find the nature of the following quadratic form, $x^2 + 5y^2 + z^2 + 2xy + 2yz + 6zx$ (06 Marks)

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10CHE12/22

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

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1 a. Choose the correct answers for the following : (04 Marks)
- A galvanic cell converts
 - Electrical energy into chemical energy.
 - Chemical energy into electrical energy
 - Electrical energy into heat energy
 - Chemical energy into heat energy.
 - Nernst equation is based on
 - Thermodynamic principle
 - An equation for redox potential
 - Increase in the free energy of the system
 - None of the above.
 - Potential of the concentration cell $\text{Cu}/\text{Cu}^{2+}_{0.0002\text{M}} \parallel \text{Cu}^{2+}_{0.02\text{M}}/\text{Cu}$ at 25°C is
 - 0.0259 V
 - 0.0295V
 - 0.0591V
 - 0.0519V
 - Ag - AgCl electrode is
 - Primary reference electrode
 - Secondary reference electrode
 - Metal – metal ion electrode
 - Membrane electrode
- b. Define single electrode potential. Explain the origin of electrode potential. (04 Marks)
- c. A cell is constructed by coupling zinc electrode dipped in 0.05M ZnSO_4 and nickel electrode dipped in 0.5M NiSO_4 . Write the cell representation, cell reaction and calculate EMF of the cell. Given that standard reduction potentials of zinc and nickel electrodes as -0.76V and -0.25V respectively. (05 Marks)
- d. What is ion selective electrode? Explain the determination of pH using glass electrode. (07 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- In which battery, a key component is separated from rest of the battery prior to activation
 - Primary battery
 - Secondary battery
 - Reserve battery
 - None of these
 - Electrolyte used in the dry cell is
 - MnO_2
 - Graphite
 - $\text{ZnCl}_2 + \text{NH}_4\text{Cl}$
 - H_2O
 - During recharge of lead-acid battery, the concentration of sulphuric acid
 - Increases
 - Decreases
 - Becomes zero
 - Remains constant
 - Oxidation of methanol in methanol – oxygen fuel cell involves the loss of
 - $1 \bar{e}$
 - $4 \bar{e}$ s
 - $2 \bar{e}$ s
 - $6 \bar{e}$ s
- b. Explain the following battery characteristics: (06 Marks)
- Voltage
 - Capacity
 - Cycle life.
- c. Describe the construction and working of Nickel – Metalhydride battery. Mention its uses. (05 Marks)

d. What are fuel cells? Explain the construction and working of Hydrogen – Oxygen fuel cell. (05 Marks)

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

- i) In corrosion, the gas which is produced in acidic medium is
A) Hydrogen B) Oxygen C) Nitrogen D) Carbon dioxide
- ii) Corrosion of steel boiler along the riveted portions is an example of
A) Differential aeration corrosion B) Differential metal corrosion
C) Stress corrosion D) Grain boundary corrosion
- iii) Iron containers to store the food stuffs are coated with
A) Zn B) Al C) Ni D) Sn
- iv) In anodized aluminium, the corrosion protection is due to
A) Passive oxide coating B) Phosphate coating
C) Chromate coating D) None of these

b. Explain the following types of corrosion :

- i) Differential aeration corrosion ii) Stress corrosion. (06 Marks)

c. Discuss the influence of following factors on the rate of corrosion.

- i) Nature of corrosion product ii) pH. (04 Marks)

d. What is Cathodic protection? Explain sacrificial anode method of corrosion control.

(06 Marks)

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

- i) Technological importance of metal finishing is to impart
A) Corrosion resistance B) Solderability
C) Thermal resistance D) All of the above
- ii) The function of complexing agent in the electrolyte bath is to
A) Increase conductivity B) Increase metal ion concentration
C) Decrease metal ion concentration D) None of these
- iii) The anode used in electroplating of chromium is
A) Chromium B) Copper C) Pb - Sb D) Graphite
- iv) The process used to manufacture a double sided printed circuit board is
A) Electroless plating B) Electro plating
C) Immersion plating D) Phosphating

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

c. Define the following terms :

- i) Decomposition potential ii) Polarisation iii) Throwing power. (06 Marks)

d. Distinguish between electroplating and electroless plating. (04 Marks)

PART - B

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

- i) Bomb calorimeter is used for the determination of calorific value of
A) Solid fuel B) Liquid fuel
C) Both solid and liquid fuels D) Gaseous fuel
- ii) Which of the following possesses zero octane number?
A) Iso octane B) α - methyl naphthalene
C) n - heptanes D) Cyclohexane
- iii) Catalysts used in catalytic converter are
A) Ni, Co and Cr B) Pt, Pd and Rh C) SiO_2 and Al_2O_3 D) Zeolite
- iv) Synthesis of biodiesel involves
A) Redox reaction B) Hydrolysis
C) Esterification D) Trans esterification

- b. What is reforming of petroleum? Give any three reactions involved in reforming. (05 Marks)
- c. Define Gross calorific value and net calorific value. Calculate GCV and NCV from the following data :
 Mass of fuel sample = 0.87×10^{-3} kg ; Mass of water in the copper calorimeter = 2.35 kg
 Water equivalent of calorimeter = 0.45 kg ; Increase in temperature of water = 2.8°C
 Specific heat of water = $4.187 \text{ kJ/kg}^{\circ}\text{C}$; Latent heat of steam = 2457 kJ/kg
 Percentage of hydrogen in fuel sample = 3.8. (06 Marks)
- d. What is Photovoltaic cell? Explain the construction and working of PV cell. (05 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- The equation of condensed phase rule is
 A) $F = C - P + 2$ B) $F = C - P + 3$ C) $F = C - P + 1$ D) None of these
 - An invariant one component water system has
 A) Two phases B) Three phases C) One phase D) No phase
 - In potentiometer redox titrations, the calomel electrode is used in combination with
 A) Platinum electrode B) Glass electrode
 C) Ag/AgCl electrode D) Quinhydrone electrode
 - Conductometric estimation is based on
 A) Beer – Lambert's law B) Nernst equation
 C) Henderson – Hesselbach equation D) Ohm's law
- b. State Gibb's phase rule. Draw and explain the phase diagram of water system. (07 Marks)
- c. State Beer's law and Lambert's law. (04 Marks)
- d. Discuss the application of potentiometry in the estimation of FAS using standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution. (05 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- Termination of polymerization in case of addition polymerization is by
 A) Combination of two growing chains
 B) Combination of growing chain with free radical of initiator
 C) Disproportionation D) All of these
 - The polymer widely used in making inner tubes of tyre is
 A) Neoprene rubber B) Butyl rubber
 C) Styrene – butadiene rubber D) Natural rubber
 - Matrix used during the synthesis of polymer composite is
 A) Thermosetting resin B) Formaldehyde
 C) Benzene D) None of these
 - Which of the following is conducting polymer?
 A) Aniline B) Acetylene C) Polypyrrole D) None
- b. What is glass transition temperature? Explain the factors influencing Tg value. (05 Marks)
- c. Explain the manufacture of plastics by injection moulding process. (05 Marks)
- d. What are conducting polymers? Discuss the mechanism of oxidative doping of polyacetylene. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- COD of waste water is expressed in
 A) PPM of $\text{K}_2\text{Cr}_2\text{O}_7$ B) mg of oxygen per litre
 C) mg of CaCO_3 D) PPM of CaCO_3
 - Excessive fluoride in water leads to
 A) Dental carriers B) Silicosis C) Fluorosis D) All of these

- iii) The method used for secondary treatment of sewage is
- | | |
|-----------------------------|--------------------------|
| A) Activated sludge process | B) Ion – exchange method |
| C) Reverse Osmosis | D) Electro - dialysis |
- iv) Chloride content of water sample is determined by
- | | |
|------------------------|-------------------------|
| A) Colorimetric method | B) Argentometric method |
| C) SPADNS method | D) Gravimetric method |
- b. What is Hard water? Explain the estimation of total hardness of water by EDTA method. (06 Marks)
- c. What is desalination? Explain desalination of water by reverse osmosis. (06 Marks)
- d. 25CC of waste water was mixed with 25CC of $K_2Cr_2O_7$, acidified and refluxed. The unreacted $K_2Cr_2O_7$ required 8.5CC of 0.25N FAS. In a blank titration 25CC of $K_2Cr_2O_7$ acidified required 17.8CC of same FAS. Calculate COD of waste water. (04 Marks)

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10PHY12/22

First/Second Semester B.E. Degree Examination, June/July 2015
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 : Planck's constant $h = 6.63 \times 10^{-34} \text{ J-S}$;

Electron mass $m_e = 9.11 \times 10^{-31} \text{ kg}$, velocity of light $c = 3 \times 10^8 \text{ m/s}$,
Neutron mass $m_n = 1.67 \times 10^{-27} \text{ kg}$, $\epsilon_0 = 8.85 \times 10^{-12} \text{ Fm}^{-1}$,
Boltzmann constant $k = 1.38 \times 10^{-23} \text{ J/K}$.

PART - A

- 1 a. Choose the correct answers for the following : (04 Marks)
 - i) The law which describes black body radiation spectrum completely is _____.
A) Stefan's law B) Wien's law C) Planck's law D) Rayleigh Jeans law
 - ii) Photoelectric effect established the _____.
A) wave nature of light B) particle nature of light
C) particle nature of matter D) wave nature of matter
 - iii) Compton wavelength is given by $\lambda =$ _____.
A) h/m_0c B) m_0c/h C) m_0c/h^2 D) h^2/m_0c^2
 - iv) De-Broglie wavelength of an electron accelerated by 100 volt is
A) 1.226 nm B) 1.226 Å C) 1.226 μm D) 1.226 mm.
- b. Describe Davisson – Germer experiment which proved the matter wave theory. (08 Marks)
- c. Define phase velocity and show that $v_g v_p = c^2$. (04 Marks)
- d. Find the kinetic energy of a neutron in eV, whose deBroglie wavelength is 1 Å. (04 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
 - i) The energy of a particle in the lowest state, in one dimensional infinite potential well of width 'a' is
A) $h\gamma$ B) $h^2/8ma^2$ C) $h/8ma^2$ D) $h^2/8a^2$
 - ii) Kinetic energy of an electron accelerated by a potential of 50 volts is _____.
A) 50 eV B) 50 J C) 5 eV D) 5 J
 - iii) A wave function is an acceptable one if it is
A) finite everywhere B) continuous everywhere
C) single valued everywhere D) having all these properties
 - iv) The probability of finding a free particle trapped in a potential well of width 'a' and infinite height, in the first excited state at the midpoint 'a/2' is
A) 0.5 B) 1 C) 0 D) 0.25.
- b. State and explain Heisenberg's uncertainty principle. (04 Marks)
- c. Derive the eigen function and eigen value for a free particle in one dimensional, infinite potential well. (08 Marks)
- d. The speed of an electron is measured as $4 \times 10^5 \text{ m/s}$ with 0.01% uncertainty. Calculate the minimum uncertainty involved in the position measurement simultaneously. (04 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- Mobility of electrons in a metal is given by ____
 A) V_d/E B) $V_d E$ C) E/V_d D) $eV_d E$
 - When temperature increases the resistivity of a metal ____
 A) decreases B) remain the same C) increases D) reduces to zero
 - Fermi factor for $E = E_F$ at $T > 0^\circ \text{K}$ is
 A) 1 B) 0 C) $1/2$ D) 2
 - As per classical free electron theory the expression for electrical conductivity is $\sigma =$
 A) $m/ne^2\tau$ B) mne^2/τ C) $ne^2/m\tau$ D) $ne^2\tau/m$
- b. Explain the failure of classical free electron theory. (06 Marks)
- c. State Matthiessen's rule and explain how does electrical conductivity of a metal changes with impurity and temperature. (06 Marks)
- d. Calculate the probabilities of an electron occupying energy levels 0.02 eV above Fermi level and 0.02 eV below Fermi level at 200 K. (04 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- If the distance between the plates of a capacitor is doubled, the value of capacitance is
 A) doubled B) increased to four times
 C) halved D) remains the same
 - The polarization that occurs in the frequency range 10^{13} Hz to 10^{16} Hz is
 A) electronic B) ionic C) orientational D) space charge
 - The relation connecting electric displacement D and electric field E is ____
 A) $D = \epsilon + E$ B) $D = \epsilon E$ C) $D = \epsilon - E$ D) $D = \epsilon/E$
 - Which of the following is a piezoelectric material?
 A) lead B) mica C) quartz D) iron.
- b. Give qualitative explanation for dia, Para and Ferro magnetisms. (06 Marks)
- c. Explain the four types of electric polarizations and the effect of temperature on them. (06 Marks)
- d. When a NaCl crystal is subjected to an electric field of strength 1000 V/m, the polarization produced is $4.3 \times 10^{-8} \text{ C/m}^2$. Calculate the dielectric constant of NaCl. (04 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- Life time of an atom in a metastable state is of the order of
 A) nano seconds B) milliseconds C) seconds D) picoseconds
 - In a He-Ne gas laser, the ratio of He atom to Ne atoms is of the order
 A) 1 : 1 B) 1 : 10 C) 10 : 1 D) 100 : 1
 - Pumping process in diode laser is by
 A) optical pumping B) forward bias C) electric discharge D) reverse bias
 - The method used in the measurement of atmospheric pollutants using laser is called ____
 A) LIDAR B) RADAR C) SONAR D) Holography
- b. Explain the terms: induced absorption, spontaneous emission and stimulated emission and obtain an expression for the energy density of radiation under equilibrium in terms of Einstein's coefficients. (09 Marks)
- c. What are the requisites of a laser? (03 Marks)
- d. The average output power of a laser source emitting beam of wavelength 633 nm is 5 mW. Find the number of photons emitted per second by the source. (04 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- The acceptance angle of an optical fiber whose refractive indices of core and cladding are 1.55 and 1.50 respectively when kept in air is ____
A) 45° B) 23° C) 32° D) 39°
 - The number of modes supported by an optical fiber with V number 20 is ____
A) 200 B) 20 C) 400 D) 10
 - Number of critical magnetic fields in a type II superconductor is ____
A) zero B) one C) two D) three
 - The superconductor behaves like a perfect ____
A) Diamagnet B) paramagnet C) Ferromagnet D) Antiferromagnet
- b. With neat diagrams describe three types of optical fibers based on propagation of light. (06 Marks)
- c. Distinguish between Type I and Type II super conductors. (06 Marks)
- d. Find out the ratio between the N.As of an optical fiber with refractive indices of core 1.41 and of cladding 1.40, when kept in air and water. (04 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- The packing factor for bcc structure is ____
A) 0.74 B) 0.52 C) 0.48 D) 0.68
 - The co-ordination number for fcc structure is ____
A) 12 B) 8 C) 6 D) 1
 - Miller indices for a plane parallel to Y – Z plane is ____
A) (011) B) (100) C) (010) D) (001)
 - Structure of NaCl is ____
A) Simple cube B) bcc C) fcc D) none of these.
- b. Describe Bragg spectrometer and explain how the interplanar spacing in a crystal can be determined using it. (06 Marks)
- c. Define packing factor. Calculate the packing factors for simple cubic and fcc structures. (06 Marks)
- d. Copper has fcc structure with atomic radius 0.1278 nm, Calculate the interplanar spacing for (321) plane. (04 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- The state of matter around the nanosize is known as ____
A) solid state B) mesoscopic state C) liquid state D) plasma state
 - Number of carbon atoms in a Bucky ball is ____
A) 70 B) 90 C) 12 D) 60
 - Ultrasonics can be produced by ____
A) photoelectric effect B) Compton effect
C) reverse piezo electric effect D) thermonic emission
 - Frequency of ultrasonic's is ____
A) < 20 KHz B) > 20 KHz C) < 20 Hz D) between 20 Hz to 20 KHz.
- b. What is non destructive testing? Explain with principle, the NDT method using ultrasonic to detect the flaws in a solid. Also mention two advantages of ultrasonic NDT. (08 Marks)
- c. What is carbon nanotube? Distinguish between SWCNTs and MWCNTs. (05 Marks)
- d. Explain any three applications of carbon nanotubes. (03 Marks)

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10CCP13/23

First/Second Semester B.E. Degree Examination, June/July 2015
Computer Concepts and C Programming

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. i) Which of the following task is performed by a computer
 A) processing B) input C) output D) all of these
 ii) The _____ section within the CPU contains the stored program
 A) secondary storage B) primary storage C) both A and B D) neither A and B
 iii) A small unit consisting of integrated circuits is sometimes called as
 A) processor B) chip C) circuit D) gadget
 iv) What hardware was used by first generation computers?
 A) vaccum tubes B) valves C) VLSI D) ICs. (04 Marks)
 b. Describe the features of a computer. (06 Marks)
 c. What are printers? Explain the types of printers. (06 Marks)
 d. Explain the different types of microprocessors. (04 Marks)

- 2 a. i) Categorize the CD – ROM is the following memory device
 A) semiconductor memory B) memory register
 C) magnetic memory D) none of these
 ii) Two basic types of operating systems are
 A) sequential and direct B) batch and interactive
 C) batch and time sharing D) sequential and real time.
 iii) Which of the following topology is not broadcast type
 A) star B) bus C) ring D) tree
 iv) Identify the odd term among the following group
 A) coaxial cable B) optical fibre C) twisted pair wire D) microwaves (04 Marks)
 b. What is operating systems? Explain the different types of operating systems. (08 Marks)
 c. Explain the need of networking and benefits of networking. (08 Marks)

- 3 a. i) Which of the following is considered as a token in C language
 A) keyword B) identifier C) operator D) all of the above
 ii) The keyword among the following passes the program control out of block
 A) continue B) if C) break D) goto
 iii) In a C program, prior to using a variable, you must first _____ it
 A) initialize B) declare C) define D) both A and B
 iv) What will be the output of the following int a = b = c = 3 ;
 printf(“%d %d %d”, a, b, c)
 A) 3 3 3 B) garbage value C) 0 0 0 D) error. (04 Marks)
 b. Write a flowchart to input three numbers and print largest of three numbers. (06 Marks)
 c. Write a structure of a C program. (05 Marks)
 d. What is a variable? How it is declared and initialized? Give example. (05 Marks)

- 4 a. i) Which of the following is a ternary operator,
 A) >= B) < C) ? : D) &&
 ii) Which is the floating point constant
 A) '400.0' B) 0.0457 C) "0.0457" D) 457
 iii) What is the associativity of == relational operator
 A) left to right B) right to left C) no associativity D) none of the above
 iv) Which statement is similar to a ? b = c : d?
 A) (a ? b = c) : d B) (a ? b) = (c : d) C) a ? (b = c : d) D) a ? (b = c) : d.
 (04 Marks)
 b. What are operators? Explain the different types of operators. (10 Marks)
 c. Write a program to find the roots of a quadratic equation. (06 Marks)

PART – B

- 5 a. i) Array elements cannot be passed to a function using.
 A) call by value B) call by reference C) both A and B D) none of these
 ii) When a function does not return any value its return type is ____
 A) void B) null C) zero D) both A and B
 iii) Identify the error in the program segment
 function (int a, int b)
 {
 int a ;
 a = 40 ;
 return (b) ;
 }
 A) the function should be defined as int function (int a, int b)
 B) variable is re-declared
 C) both A and B
 D) neither of A and B
 iv) The getchar() and putchar() functions belongs to
 A) stdio.h B) conio.h C) string.h D) ctype.h (04 Marks)
 b. Write a program using function to sort an array of integers. (08 Marks)
 c. What are the parameter passing mechanism in C? Explain in brief. (08 Marks)
- 6 a. i) Which of the following 'C' statement branches unconditionally from one point to another point in the program?
 A) if B) goto C) switch D) if-else
 ii) When more than one if-else statements are used in a sequence. It is known as ____
 A) if else ladder B) nested if else C) if else block D) nested else
 iii) Which of the following executes one or more statements repeatedly until a condition is met?
 A) if B) switch C) for D) continue
 iv) A loop with no test condition is ____
 A) while B) do ---- while C) for D) none of these (04 Marks)
 b. Write a program using do ---- while loop to display numbers 1 to 10, without using arrays. (08 Marks)
 c. Differentiate between while and do ---- while loop. (08 Marks)

- 7 a. i) How many dimensions an array can have?
 A) one dimension B) two dimension
 C) three dimension D) any no. of dimensions.
- ii) How many elements can be added or removed from an array at a time
 A) 2 B) 1 C) 4 D) 6
- iii) What is the output of the following code,
`int x[2][2] = {3, 2, 5, 4};`
`printf("%d", x[1][1]);`
 A) 3 B) 4 C) 5 D) 2
- iv) Elements of an array are stored in
 A) Random memory locations B) sequential memory locations
 C) scattered memory locations D) direct memory locations. (04 Marks)
- b. Write a program to print the product of two dimensional arrays. (10Marks)
- c. What is an array? Explain the types of an array with examples. (06Marks)
- 8 a. i) Open MP stands for
 A) open multiprocessing B) open main parallelism
 C) open multitasking parallelism D) open multiprocessor
- ii) The ____ function provides the number of processors, which is used to process a program.
 A) omp-get-num-procs() B) omp-get-num-threads()
 C) omp-get-thread-num() D) omp-set-num-threads()
- iii) Open MP is an API, which is based on
 A) join model B) Fork – Join model C) Joint – fork model D) structural model
- iv) The main components of open MP are directives, environmental variables and ____
 A) Runtime variables B) library functions
 B) C) instances variables D) none. (04 Marks)
- b. What is synchronization in open MP? Explain the different synchronization constructs. (08 Marks)
- c. Write a program to find the factorial of a number using open MP. (08 Marks)

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

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
- Remote sensing is a type of
 A) Smelling with a remote
 C) Construction technology
 B) Surveying
 D) Transportation system
 - Fencing is provided to
 A) Village roads
 C) National highways
 B) State highways
 D) Express highways
 - A Bascule bridge is a
 A) Floating bridge
 C) Suspension bridge
 B) Arch bridge
 D) Movable bridge
 - Shoulders are the components of
 A) Roads
 B) Bridges
 C) Dams
 D) Building.
- b. Explain how the infrastructure development will help the growth of economy of the country. (06 Marks)
- c. Explain briefly the scope of civil engineering in geotechnical engineering. (04 Marks)
- d. Explain: i) Kerbs in roads ii) Galleries in dams. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- A particle has
 A) Only Mass
 B) Only Size
 C) Both Mass and Size
 D) Neither Mass nor Size
 - To define a force completely, the following characteristics should be specified:
 A) Magnitude and direction
 B) Point of application
 C) Line of action
 D) All of these
 - The forces which pass through a single point and lie in the same plane are
 A) Collinear forces
 B) Coplanar non-concurrent forces
 C) Coplanar concurrent forces
 D) None of these
 - Which of the following is the basic concept of mechanics?
 A) Change
 B) Power
 C) Force
 D) Energy.
- b. State three principles of forces. (06 Marks)
- c. Define a couple. Mention its characteristics. (04 Marks)
- d. For the brake pedal shown in Fig.Q.2(d), determine the smallest force P which has a 104 Nm clockwise moment about B. (06 Marks)
- 3 a. Choose the correct answers for the following : (04 Marks)
- The resultant force of two concurrent forces become maximum and minimum, if angle between them is
 A) 0° and 180°
 B) 0° and 90°
 C) 90° and 0°
 D) None
 - 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
 A) P
 B) $\sqrt{2} P$
 C) $-P/2$
 D) $P/\sqrt{2}$
 - Component of a force at right angles to its line of action is
 A) Zero
 B) Positive
 C) Negative
 D) None of these
 - Method of finding resultant force of a number of given forces is called
 A) Composition
 B) Resolution
 C) Decomposition
 D) None of these.

- b. State and prove Varignon's theorem of moments. (08 Marks)
- c. A bracket is subjected to a system of forces as shown in Fig.Q.3(c). Determine the magnitude, direction and line of action of the resultant from 'A'. (08 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- Centroid of plane is the point at which
 - Volume of body concentrated
 - Surface area is assumed to be concentrated
 - Weight of the body concentrated
 - All of these
 - An axis over which one half of the plane figure is just mirror image of the other half is
 - Axis of symmetry
 - Unsymmetrical axis
 - Bottom most axis
 - None of these
 - The centroid of a circle is
 - At centre
 - Along circumference
 - along tangent
 - outside circle
 - The centroid of a lamina is determined by the principles of
 - Lamis theorem
 - Varignon's theorem
 - Triangle law of forces
 - None of these
- b. Determine the centroid of a semicircle from first principles. (06 Marks)
- c. Locate the centroid of the shaded area shown in Fig.Q.4(c) with respect to point 'A'. (10 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- The force which is equal in magnitude and opposite in direction to resultant is
 - Couple
 - Moment
 - Equilibrant
 - None of these
 - For a smooth spherical surface reaction acts
 - Horizontal to the plane of contact
 - Inclined to the plane of contact
 - Perpendicular to the plane of contact
 - None of these
 - A free body diagram is a diagram
 - Of a body suspended freely in air
 - Drawn by free hand
 - Drawn by detaching the body from its attachments with surrounding and replacing the attachments with force vector.
 - Of a body in vacuum
 - The procedure of resolution is
 - To find the equilibrant
 - To find the resultant of the system
 - To find two components of an inclined force
 - None of these
- b. Explain different types of beams with sketches. (08 Marks)
- c. A 500N cylinder of 1m diameter is loaded between the cross pieces which make an angle of 60° with each other and are pinned at 'C' as in Fig.Q.5(c). Determine the tension in the horizontal rope DE assuming smooth floor. (08 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- When load acts at constant rate over given length of beam it is called
A) udl B) uvl C) point load D) none of these
 - For a perfect frame, a guide line for identifying is
A) $m \neq 2j - 3$ B) $m = 2j - 3$ C) $m = 2j + 3$ D) $m = 3 - j$
 - A beam is said to be determinate, if
A) the reactions can be determined using the equations of equilibrium
B) the reactions can be determined using the force equilibrium conditions
C) the reactions can be determined using the moment equilibrium conditions only
D) the reactions cannot be determined using the equations of equilibrium.
 - The minimum number of members to form a perfect truss is
A) 2 B) 3 C) 4 D) 1
- b. Determine the tension in cable AB and AC required to hold a 50kg crate shown in Fig.Q.6(b). (06 Marks)
- c. Three cylinders A, B and C weighing 150N, 400N and 200N respectively are piled in a channel as shown in Fig.Q.6(c). Determine the reactions offered by the walls and floors. Radii of A, B and C are respectively 40cm, 60cm and 50cm. (10 Marks)
- 7 a. Choose correct answers for the following : (04 Marks)
- The friction experienced by a body when it rolls over another body is called
A) Sliding friction B) Rolling friction
C) Static friction D) None of the above
 - If the angle of friction is zero, a body will experience
A) Zero friction
B) Infinite friction
C) The force of friction in the direction of motion
D) The force of friction normal to the plane
 - The maximum inclination of the plane on which the body free from external forces, can repose is called
A) Angle of friction B) Cone of friction C) Angle of repose D) None of these
 - Force of friction developed at contact surface is
A) Opposite to the direction of motion B) Perpendicular to plane
C) Along the direction of motion D) All of these.
- b. State laws of friction. (06 Marks)
- c. Determine the force P required to cause motion of blocks to impend. Take the weight of A as 90N and weight of B as 45N. Take the coefficient of friction for all contact surfaces as 0.25 as shown in Fig.Q.7(c). Consider the pulley being frictionless. (10 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- If I_G is the moment of inertia of a rectangle about its centroidal axis parallel to the base 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
 - The unit of moment of inertia of an area is
A) m^2 B) m^4 C) m^3 D) N/m^2
 - Radius of gyration may be defined mathematically as
A) $\frac{I}{A}$ B) $\frac{A}{I}$ C) $\sqrt{\frac{I}{A}}$ D) $\sqrt{\frac{A}{I}}$
 - The value of moment of inertia depends upon
A) Weight of material B) Density of material
C) Cross sectional dimensions D) Type of material.
- b. Derive the expression for moment of inertia of a circle about its diametral axis. (06 Marks)
- c. Determine the moment of inertia of the area shown in Fig.Q.8(c) about the base AB and the centroidal axis parallel to AB. (10 Marks)

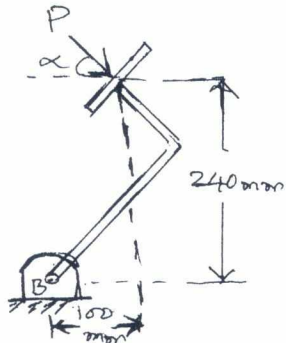


Fig.Q.2(d)

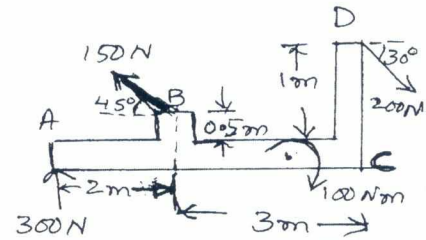


Fig.Q.3(c)

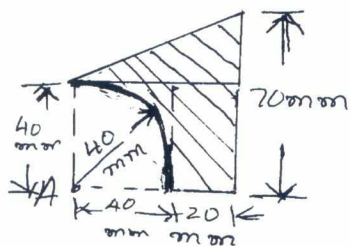


Fig.Q.4(c)

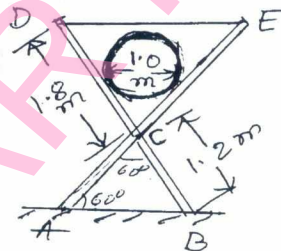


Fig.Q.5(c)

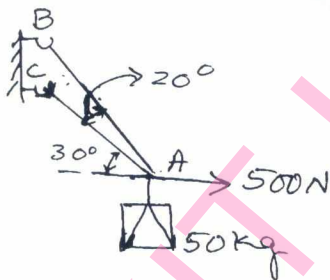


Fig.Q.6(b)

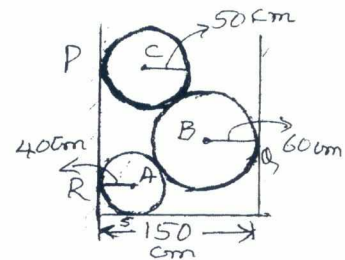


Fig.Q.6(c)

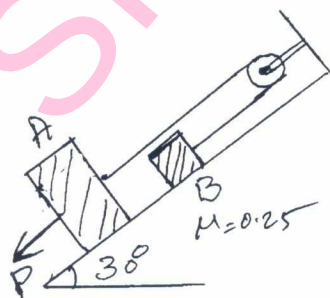


Fig.Q.7(c)

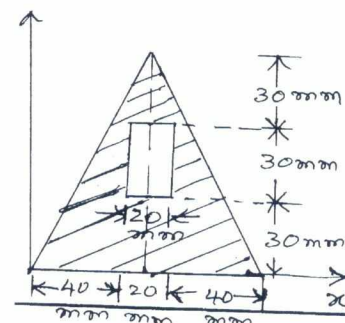


Fig.Q.8(c)

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10EME14/24

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

Time: 3 hrs.

Max. Marks: 100

**Note: 1. Answer any FIVE full questions,
 selecting at least two from each part.
 2. Use of steam table is permitted.**

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)**
- Wind energy is an example for ____
 A) capital energy B) celestial energy C) transitional energy D) stored energy
 - Renewable energy sources are
 A) hazardous to environment B) exhaustible
 C) non – exhaustible D) not freely available
 - The amount of heat required to increase the temperature of dry steam above its saturation temperature is called as ____
 A) sensible heat B) enthalpy of superheat
 C) enthalpy of superheated steam D) latent heat
 - _____ is used to extinguish the fire in the furnace of the boiler when water level falls too much below the normal level.
 A) blow-off cock B) steam stop valve
 C) water level indicator D) fusible plug.
- b. A steam at 10 bar and dryness fraction 0.98 receives 140 kJ/kg at the same pressure. What is the final state of steam? Also find the density of steam in its final state. Take, C_p for superheated steam = 2.1 kJ/kg K. (08 Marks)**
- c. With a neat sketch, explain the working of a water tube boiler. (08 Marks)**
- 2 a. Choose the correct answers for the following : (04 Marks)**
- Delaval turbine is ____
 A) impulse water turbine B) gas turbine
 C) impulse steam turbine D) none of the above
 - Gas turbines mainly used in
 A) aviation B) electric power generation
 C) A only D) both A and B
 - Runner of a water turbine converts
 A) pressure energy into mechanical energy
 B) kinetic energy into mechanical energy
 C) pressure energy into kinetic energy
 D) none of the above
 - Draft tube is a part of
 A) Pelton wheel B) Kaplan turbine C) Delaval turbine D) Parsons turbine
- b. Mention the function of following : i) braking jet ii) scroll casing iii) penstock iv) convergent-divergent nozzle. (04 Marks)**
- c. What do you mean by compound of steam turbine? Why it is necessary? With a neat sketch, explain velocity compounding. (12 Marks)**

- 3 a. Choose the correct answers for the following : (04 Marks)
- The following is a SI engine
A) diesel engine B) petrol engine C) gas engine D) both B and C
 - The thermal efficiency of petrol engine as compared to diesel engine is
A) lower B) higher
C) same for same power output D) same for same speed
 - In diesel cycle engine, heat is supplied at
A) constant temperature B) constant volume
C) constant pressure D) none of the above
 - In four stroke diesel engine, during suction stroke
A) only air is sucked in B) only fuel is sucked in
C) mixture of fuel and air is sucked in D) none of the above
- b. Explain with suitable sketches, P-V diagrams, the working of four stroke Otto engine. (10 Marks)
- c. The following particulars were obtained in a trial on 4-stroke engine.
Duration of trial = 1 hour, revolutions = 14000, Net brake load = 1470 N, mean effective pressure = 7.5 bar, Fuel consumption = 20000 lit, calorific value of fuel = 21 KJ/lit, cylinder diameter = 250mm, stroke = 400 mm effective brake circumference = 4 m.
Calculate : i) indicated power ii) brake power iii) mechanical efficiency iv) indicated thermal efficiency. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- One TOR is equal to
A) 310 kJ/min B) 210 kJ/min C) 110 kJ/min D) 410 kJ/min
 - _____ is used as the refrigerant in vapour absorption refrigeration system
A) Ammonia B) Freon – 12 C) Freon – 22 D) R – 134a
 - Air conditioning controls
A) humidity B) temperature
C) motion and purity of air D) all the above
 - Throttle valve in a refrigeration system
A) compresses the refrigerant B) expands the refrigerant
C) both A and B D) none of the above
- b. Define : i) COP ii) TOR. (03 Marks)
- c. Distinguish between refrigeration and air conditioning. (05 Marks)
- d. With a schematic diagram, explain the working of vapour refrigeration system. (08 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- The lathe part which slides along bed ways is called as
A) cross slide B) tool post C) compound rest D) saddle
 - The lathe operation performed to generate flat surfaces at the end of end of work piece is called as
A) turning B) facing C) knurling D) thread cutting
 - The operation of enlarging one end of a previously drilled hole through a small depth is called as
A) boring B) counter sinking C) counter boring D) reaming
 - Following is the one of the drilling operations
A) thread cutting B) facing C) taper turning D) spot facing.
- b. Mention the function of following parts of lathe : (06 Marks)
- i) apron ii) compound rest iii) cross – slide iv) lead screw v) feed screw vi) tail stock.
- c. With a neat sketch, explain the working of radial drilling machine. (10 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- The thickness of the chip is minimum at the beginning of cut and reaches maximum when the cut ends in
A) down milling B) up milling C) both A and B D) none of the above
 - The horizontal shaft provided between tapered hole spindle and bearing in the projecting overarm of milling machine is called as
A) knee B) arbor C) column D) none of the above
 - The following is the one of the natural abrasives
A) silicon carbide B) cubic boron nitride C) aluminum oxide D) corundum
 - For precision grinding, the wheels with _____ bonding process is used
A) Resinoid bond B) vetrified bond C) silicate bond D) shellac bond
- b. Name and explain with a sketch the milling operation required to produce the following :
i) V – groove ii) T – slots iii) flat surface iv) convex surface. (08 Marks)
- c. With a neat sketch, explain the working of centreless grinding machine. (08 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- Oxy-acetelene ratio for carburizing flame is
A) 1 : 1 B) 1 : 1.2 C) 0.5 : 1 D) 0.95 : 1
 - Filler metal used in brazing is
A) Silver B) lead C) aluminium D) lead and tin alloy
 - The minimum temperature at which the given oil gives off sufficient vapour to ignite is called as
A) cloud point B) fire point C) pour point D) flash point
 - Example for antifriction bearing is
A) Bushed bearing B) journal bearing C) roller bearing D) plummer block
- b. With a neat sketch, explain the principle of arc welding. (06 Marks)
- c. What are the functions of lubricant? (04 Marks)
- d. With a neat sketch, explain pivot bearing. (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- _____ is used to transmit power from one shaft to another when the centre distance is large
A) gear drive B) belt drive C) gear train D) none of the above
 - Bevel gears are used to transmit power when shafts are
A) Parallel B) non - parallel
C) perpendicular D) perpendicular and non-intersecting
 - The ratio of pitch diameter to the number of teeth is called as
A) circular pitch B) diametral pitch C) velocity ratio D) module
 - _____ is used for transmitting power when the VR is high and centre distance between the shafts is small
A) Compound gear train B) simple gear train
C) reverted gear train D) epicyclic gear train.
- b. Briefly explain the effect of creep and slip on the performance of belt drive. (06 Marks)
- c. What is idler pulley? What is its purpose? Explain. (04 Marks)
- d. A simple gear train is made up of four gears A, B, C, D having 20, 40, 60, 70 teeth. If gear A is the main driver rotating at 500 rpm clockwise, calculate :
i) speed of intermediate gears
ii) speed and direction of last follower
iii) train value. (06 Marks)

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

Basic Electrical Engineering

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
- If the current in an electric bulb drops by 2%, then power decreases by _____.
A) 1% B) 2% C) 4% D) 16%
 - Kirchoff's current lane
A) $\sum E = 0$ B) $\sum IR + \sum E = 0$ C) $EI = 0$ D) $\sum R = 0$
- The direction of induced emf can be determined by _____
A) work lane B) Ampere's law
C) Fleming's right hand rule D) Fleming's left had rule
- Mutual inductance between tow coils is 4 H. If current in one coil changes at the rate 2 A/second, then emf induce din other coil is
A) 8V B) 2V C) 0.5V D) zero volt.
- b. Find the unknown currents in the different section of the circuit shown using KCL. Also find the unknown voltages in each resistor and source. (05 Marks)

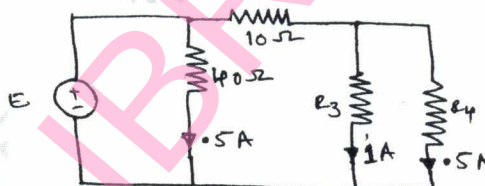


Fig. Q1(b)

- Derive an expression for energy stored in magnetic field. (05 Marks)
 - Two coils, A of 12,500 turns and B of 16,000 turns, lie in parallel planes so that 60% of flux produced in A links coil B. it is found that a current of 5A in A produces a flux of 0.6 mwb while the same current in B produces 0.8 mwb. Determine : i) mutual inductances ii) coupling co-efficient inductance of A and B. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- A heater is rated as 230V, 10KW, A.C. The value 230 V refers to _____.
A) average value B) rms value C) peak value D) none of these
 - The form factor is the ratio of :
A) peak value to rms value B) rms value to average value
C) average value to rms value D) none of these
 - Power factor of the following circuit will be zero _____.
A) resistance B) inductance C) capacitance D) both B and C
 - In a circuit containing R, L and C power loss can take place in _____.
A) C only B) L only C) R only D) all of the above.
- b. Find the relation between peak value and rms value of sinusoidal voltage wave form. (04 Marks)
- c. Four voltages are represented by _____
- $$V_1 = 100 \sin 314 t \quad V_2 = 250 \cos 314 t$$
- $$V_3 = 150 \sin \left(314 t + \frac{\pi}{4} \right) \quad V_4 = 200 \sin \left(314 t - \frac{\pi}{4} \right)$$
- Calculate the resultant voltage and express in the form $V = V_m \sin (314 t \pm \phi)$. (06 Marks)
- d. An induction furnace load requires 400 KW and 800 KVAR at 11KV (single phase), 50 Hz, Find : i) Power factor of pf angle ii) Current iii) Value of apparent power. (06 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- In star connected balanced resistor load, the voltage rating of each resistor should be –
 A) equal to line voltage B) $\sqrt{2} \times$ line voltage C) $\frac{\text{Line voltage}}{\sqrt{3}}$ D) none of the above
 - In balanced 3 – phase system, power consumed is given by _____
 A) $\sqrt{3} V_L I_L \cos \phi$ B) $3 V_P I_P \cos \phi$ C) $3 I_P^2 R_P$ D) options A, B & C
 - Three identical resistances connected in star consume 4000 W. if the resistances are connected in delta across the same supply, the power consumed will be _____
 A) 4000 W B) 6000 W C) 8000 W D) 12000 W
 - In two wattmeter method of power measurement in 3 – phase balanced load, both the wattmeters give equal reading when the load pf is _____
 A) 0.5 B) zero C) between 0.5 and one D) one.
- b. With the aid of a phasor diagram obtain the relationship between the line and phase values of voltages in three phase, star connected load. (06 Marks)
- c. A delta – connected load draws a current of 15 A at a lagging power factor of 0.85 from a 400V, 3-phase, 50Hz supply. Find the resistance and inductance of each phase. (05 Marks)
- d. A 3 – phase motor load has a pf. Of 0.397 lagging. Two wattmeters connected to measure power show the input as 30 KW. Find the reading on each wattmeter. (05 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- A dynamometer wattmeter can be used for _____
 A) both DC and AC B) DC only C) AC only D) neither A, B or C
- In a portable instrument, the controlling torque is provided by _____
 A) spring B) gravity C) eddy current D) all of the above
 - A fuse is a _____
 A) protective device B) current limiting device
 C) voltage limiting device D) power limiting device
 - The earthen wire should be _____
 A) good conductor of electricity B) mechanically strong
 C) both A & B D) bad conductor of electricity.
- b. Name various types of wiring system commonly used and explain any one of them in detail. (05 Marks)
- c. Explain pipe earthing with a neat diagram. (05 Marks)
- c. With a neat diagram, explain the construction of and working principle of dynamometer type wattmeter. (06 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- In the armature, DC generator generates
 A) AC voltage B) DC voltage C) AC superimposed over DC D) none of the above
 - The number of parallel paths in the armature winding of four pole wave connected Dc machine having 28 coil side is _____
 A) 28 B) 14 C) 4 D) 2
 - The back emf of DC motor is given as _____
 A) $V + I_a R_a$ B) $V - I_a R_a$ C) V D) none of the above
 - The armature of DC machine is made up of laminated sheet in order to –
 A) reduce armature copper loss B) reduce eddy current loss
 C) reduce hysteresis loss
 D) increase the dissipation of heat from the armature surface.
- b. Explain the construction features of a DC machine. (06 Marks)
- c. Derive torque equation of a DC motor. (05 Marks)
- d. An 8 – pole lap-connected armature has 40 slots with 12 conductors per slot generates a voltage of 500 V. Determine the speed at which it is running if the flux per pole is 50 mwb. (05 Marks)

- 6 a. Choose the correct answers for the following :
- The main purpose of using magnetic core in a transformer is to _____.
A) prevent eddy current B) eliminate magnetic hysteresis
C) decrease iron losses D) decrease the reluctance of the common magnetic flux path.
 - 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
 - Losses which do not occur in transformers are _____.
A) copper losses B) magnetic losses C) friction losses D) none of these
 - If full load cu loss of transformer is 1600 W, its cu loss at half load will be _____.
A) 400 W B) 800 W C) 1600 W D) 200 W
- b. What are the various losses that occur in transformer? Give the equations for these losses. (05 Marks)
- c. 1000 KVA transformer has primary and secondary turns of 400 and 100 respectively and induced voltage in secondary is 1000 V. i) Find primary volts ii) The primary and secondary full load currents iii) Secondary current when 100 KW load at 0.8 pf is connected at the output. (06 Marks)
- d. A transformer is rated at 100KVA. At full load its copper loss is 1200W and its iron loss is 960W. Calculate: i) Efficiency at full load, unite pf ii) Efficiency at half load, 0.8 pf. (05 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- The frequency of voltage generated by an alternator having 4 – poles and rotating at 1800 rpm is _____ hertz.
A) 60 B) 7200 C) 120 D) 450
 - The main disadvantage of using short-pitch winding in alternator is that it –
A) reduces harmonics B) produces asymmetry in the three phase winding
C) increases cu of end connection D) none of the above
 - Salient pole generators are characterized by their _____.
A) small diameter B) large axial length
C) large diameter and short axial length D) none of the above
 - In alternator _____.
A) armature rotates B) field stationary
C) armature stationary and field rotates D) none of the above
- b. Explain the construction features of three phase synchronous generator. (08 Marks)
- c. A 3 – phase, 16 – pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb and speed is 375 rpm. Find the frequency, phase and line emf. Assume full pitched coil and $k_d = 0.96$. (08 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- Two types of 3-phase induction motors are _____.
A) split phases repulsion B) shaded – pole and universal
C) squirrel cage and slip ring D) none of the above
 - Rotating magnetic field in induction motor rotates at _____.
A) synchronous speed B) less than synchronous speed
C) more than synchronous speed D) none of the above
 - Slip of the induction motor is equal to _____.
A) $S = N_s - N$ B) $S = (N_s - N)/N_s$ C) $S = N - N_s$ D) $S = (N - N_s)/N$
 - Starter restrict – _____.
A) high starting current B) speed C) current and voltage D) none of the above.
- b. Explain the concept rotating magnetic field in three phase induction motor. (06 Marks)
- c. Derive the equation for rotor frequency in terms stator frequency. (04 Marks)
- d. A 3-phase induction motor is wound for 4-poles and is supplied from 50 Hz system. calculate : i) The synchronous speed ii) The rotor speed when slip is 4% iii) Rotor frequency when rotor runs at 600 rpm. (06 Marks)

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10ELN15/25

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

Time: 3 hrs.

Max. Marks: 100

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

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)**
- The reverse saturation current of germanium diode at 25°C is
 A) 100 nA B) 0.7A C) 0.3A D) 1μA
 - For every 1°C rise in temperature, the silicon diode forward voltage drop decreased by
 A) 2 mV/°C B) 2.02 mV/°C C) 1.8 nV/°C D) 0.1μV/°C
 - The DC output voltage of a bridge rectifier having a total secondary peak voltage of 100 V is _____ volts
 A) 63.6 V B) 31.8 V C) 90 V D) 70.7 V
 - Ideal value of voltage regulator for the power supply is _____
 A) minimum B) maximum C) unit D) zero
- b. With circuit and waveform, explain the working principle of a full wave bridge rectifier and derive an expression for average and RMS value of current. (10 Marks)**
- c. Design a zener diode voltage to meet the following specification. (06 Marks)**
- Unregulated DC input voltage $V_i = 10 \text{ V} \pm 20 \text{ V}$
 Regulated DC output voltage $V_0 = 5 \text{ V}$
 Minimum zener current $I_{2\min} = 5 \text{ mA}$
 Maximum zener current $I_{2\max} = 80 \text{ mA}$.
 Load current $I_r = 20 \text{ mA}$.
- 2 a. Choose the correct answers for the following : (04 Marks)**
- In a properly biased PNP transistor, some of the holes from the emitters
 A) recombine with electron in the base B) recombine in the emitter it self
 C) pass through the base to the collector D) are stopped by the junction barrier
 - The current amplification factor α_{dc} is given by
 A) I_C/I_B B) I_C/I_E C) I_B/I_E D) I_B/I_C
 - The output resistance of transistor CB configuration is
 A) 1 KΩ B) 0 Ω C) M Ω D) 100 Ω
 - The following relationship between α and β are correct EXCEPT
 A) $\beta = \alpha / 1 - \alpha$ B) $\alpha = \beta / 1 - \beta$ C) $\alpha = \beta / 1 + \beta$ D) $1 - \alpha = 1 / 1 + \beta$.
- b. With circuit and characteristic curve, explain the input and output characteristic curve of transistor CE configuration. (12 Marks)**
- c. The reverse leakage current of the transistor when connected in CB configuration is 0.1 μA. While it is 16 μA when it is in CE configuration calculate α_{DC} and β_{DC} . (04 Marks)**

3 a. Choose the correct answers for the following :

- The operating point is on the _____.
 A) output characteristic curve
 B) on the DC load line
 C) transfer characteristic curve
 D) input characteristic curve
 - The maximum peak to peak output voltage swing is obtained when the Q point of circuit is located _____.
 A) near saturation point
 B) near cutoff point
 C) at the centre of the DC load line
 D) at least on the load line
 - The more stable operating point for transistor is obtained from the ____ biasing circuit.
 A) fixed bias circuit
 B) voltage divider bias circuit
 C) collector to base bias
 D) reverse bias
 - In a transistor temperature sensitive parameter are
 A) V_{CC} and I_B
 B) V_{EE} and I_E
 C) V_{CC} and I_C
 D) V_{BE} and I_{CBO} .
- b. Write the circuit diagram for :i) voltage divider bias circuit ii) fixed bias circuit. (10 Marks)
- c. For the circuit shown in Fig. Q3(C). Find the range of operating point when $h_{FE(min)} = 50$, $h_{FE(max)} = 200$. Assume Si transistor. (06 Marks)

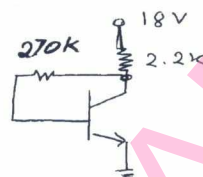


Fig. Q3(c)

4 a. Choose the correct answers for the following :

(04 Marks)

- In an SCR, the function of the gate is to _____.
 A) to control the SCR current
 B) turn on the SCR
 C) turn OFF the SCR
 D) reduce the reverse break down voltage
 - The unijunction transistor has
 A) anode, cathode and gate
 B) two base and one emitter
 C) two anode and one gate
 D) anode cathode and two gates
 - A UJT used as a
 A) amplifier
 B) relaxation oscillator
 C) rectifier
 D) inverter
 - A FET consists of _____.
 A) source
 B) drain
 C) gate
 D) all of the above.
- b. Sketch a 90° phase control circuit for an SCR and draw the load waveform. Explain the operation of the circuit. (08 Marks)
- c. Draw and explain the typical drain characteristic of an N-channel JFET with $V_{gs} = 0$. (08 Marks)

PART – B

5 a. Choose the correct answers for the following :

(04 Marks)

- In an amplifier frequency response curve, the gain of the amplifier at half power point is
 A) 0.707 of maximum value of gain
 B) 1.41 of maximum value of gain
 C) 1.11 of maximum value of gain
 D) 3.14 of maximum value of gain
 - Band width of an amplifier is the range of frequency over which the gain is _____.
 A) gain is maximum
 B) gain is one
 C) gain is zero
 D) gain constant
 - The electrical component of tank circuit are
 A) R, C
 B) R, L
 C) R, C, L
 D) L, C
 - For sustaining oscillations in an oscillator circuit
 A) feedback factor should be unity
 B) phase shift should be 0°
 C) feedback should be negative
 D) both A and B.
- b. With a circuit diagram, explain the significance of each component of RC coupled amplifier. (06 Marks)
- c. With a circuit diagram, explain the operation of a Hartley oscillator. (06 Marks)
- d. In a colPitts oscillator, $C_1 = 100$ pF and $C_2 = 60$ pF. Find the value of L, if the frequency of oscillation is 40 KHz. (04 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- Voltage gain of an voltage follower is
A) 0 B) ∞ C) 1 D) 10^5
 - The meaning of infinite band width of an op-Amp is
A) it allows the signal with 50 Hz frequency
B) it allows all the frequency from 0 to ∞ Hz
C) it allows the signal with 0Hz frequency
D) it allows the signal with frequency ∞ Hz.
 - The ideal characteristic of an op-Amp are
A) $R_i = \infty$, $R_o = 0$, $A_v = \infty$, CMRR = ∞
B) $R_i = 0$, $R_o = \infty$, $A_v = 0$, CMRR = 0
C) $R_i = 0$, $R_o = 0$, $A_v = 1$, CMRR = ∞
D) $R_i = \infty$, $R_o = 1$, $A_v = 0$, CMRR = ∞ .
 - In a non-inverting amplifier circuit, $R_F = 360$ K, $R_1 = 120$ K. The gain of the amplifier is
A) 100 B) 1000 C) 4 D) 2.
- b. Explain how an op-Amp can be used as a inverting summer. (08 Marks)
- c. A 10 mV, 5 KHz sinusoidal signal is applied to input of an op-Amp integrator circuit for which $R = 100$ K, $C = 1$ μ F. Find the output voltage. (08 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- A 400W carrier is modulated to a depth of 70%. The total power in a modulated wave is
A) 600 W B) 500 W C) 498 W D) 0.5 W
 - The BCD equivalent decimal 14 is
A) 00101010 B) 00010100 C) 10010101 D) 01000001
 - The 15's complement of $(ABC)_{16}$ is
A) CAB B) CDA C) 543 D) ACB
 - The binary number of $(0.56)_{10}$ is
A) 0.01010 B) 0.10101 C) 1.011 D) 0.10001
- b. Derive an expression for output power of an AM transmitter. (06 Marks)
- c. Perform the following : (06 Marks)
- $(ABC)_{16} + (ABCDE)_{16} = (?)_{16}$
 - Using 1's complement $(11010)_2 - (10000)_2 = (?)_2$.
- d. Perform the following : (04 Marks)
- $(6751.53)_8 = (?)_{10}$
 - $(A51.3A)_{16} = (?)_2$.
- 8 a. Choose the correct answers for the following : (04 Marks)
- The Boolean expression $x + yz$ is equal to
A) $x + y + z$ B) $(x + y)(x + z)$ C) $(x + y)z$ D) $(x + z)y$
 - The Boolean expression $A + \overline{AB}$ is equal to
A) B B) $\overline{A}$ C) $1 + \overline{B}$ D) 0
 - In EX-OR gate, if the inputs are logically same then the output is
A) 1 B) A C) B D) 0
 - The universal gates are
A) AND and OR B) NOT and NOR C) NAND and NOR D) EX-OR and EX-NOR.
- b. Simplify the Boolean expression : (04 Marks)
- $$y = AB + A(B + C) + B(B + C).$$
- c. Implement $y = \overline{ABCD}$ using, two input NOR gates. (06 Marks)
- d. Explain the operation of Fulladder and implement it using gates. (06Marks)

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10MAT21

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

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
 - i) The general solution for the equation, $x^2p^2 + 3xyp + 2y^2 = 0$ is,
 A) $(x - y - C)(x^2 + y^2 - C) = 0$ B) $(y - x - C)(x - y^2 - C) = 0$
 C) $(xy - C)(x^2y - C) = 0$ D) $(y - x - C)(x^2y + C) = 0$
 - ii) The given differential equation is solvable for y, if it is possible to express y in terms of,
 A) x and y B) x and p C) y and p D) None of these
 - iii) The singular solution of the equation, $(y - px)(p - 1) = p$ is,
 A) $y(1 + e^x) + e^x$ B) $x(1 + e^x) + e^y$ C) $y(1 + e^{-x}) + x$ D) $x(1 + e^{-x}) + e^x + 1$
 - iv) Clairuts equation of $\sin px \cos y = \cos px \sin y + p$ is,
 A) $y = px - \sin^{-1} p$ B) $x = py - \cos^{-1} p$ C) $y = xp + \cos^{-1} p$ D) $x = py + \sin^{-1} p$
- b. Solve : $p^2 + 2p \cot x = y^2$. (04 Marks)
- c. Solve : $x^2 + p^2x = yp$. (06 Marks)
- d. Solve : $y = 2px - y^2p^3$. Take $X = 2x$, $Y = y^2$. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
 - i) The complimentary function for the differential equation, $y'' - 6y' + 25y = 0$ is,
 A) $e^{2x}(C_1 \cos 3x + C_2 \sin 3x)$ B) $e^{-2x}(C_1 \cos 3x + C_2 \sin 3x)$
 C) $e^{3x}(C_1 \cos 4x + C_2 \sin 4x)$ D) $e^{-3x}(C_1 \cos 4x + C_2 \sin 4x)$
 - ii) The displacement in the simple harmonic $\frac{d^2x}{dt^2} = -\mu^2x$ is,
 A) $C_1 \cos \mu t - C_2 \sin \mu t$ B) $C_1 \cos \mu t + C_2 \sin \mu t$
 C) $C_1 \cos \mu t \pm C_2 \sin \mu t$ D) $\cos \mu t \pm \sin \mu t$
 - iii) The particular integral of $(D^2 + 4)y = \cos 2x$ is,
 A) $\frac{x \cos 2x}{4}$ B) $\frac{\cos 2x}{8}$ C) $\frac{\sin 2x}{8}$ D) $\frac{x \sin 2x}{4}$
 - iv) The solution of the differential equation, $y'' + 3y' + 2y = e^{-3x}$ is,
 A) $C_1 e^{-x} + C_2 e^{2x} + \frac{1}{2} e^{-3x}$ B) $C_1 e^x + C_2 e^{-2x} + \frac{1}{2} e^{-3x}$
 C) $C_1 e^{-x} + C_2 e^{-2x} + \frac{1}{2} e^{-3x}$ D) None of these
- b. Solve: $\frac{d^2y}{dx^2} + 4y = 2^{-x}$. (04 Marks)
- c. Solve : $\frac{d^3y}{dx^3} + 8y = x^2 e^{-2x}$ (06 Marks)
- d. Solve the system: $\frac{dx}{dt} + 2x - 3y = 5t$, $\frac{dy}{dt} - 3x + 2y = 2e^{2t}$. (06 Marks)

3 a. Choose the correct answers for the following :

(04 Marks)

- i) The Wronskian of the differential equation, $(D + 2)^2 y = \sec 2x$ is,
 A) e^{-2x} B) 2 C) e^{4x} D) e^{-4x}
- ii) The complimentary function of the differential equation, $x^2 y'' - xy' + y = \log x$ is,
 A) $C_1 x + C_2 x \log x$ B) $C_1 x + C_2 x^2$ C) $C_1 \log x + C_2 x^2$ D) $C_1 x^2 + C_2 x \log x$
- iii) The homogeneous linear differential equation whose auxillary equation has roots 1, -1 is,
 A) $x^2 y_2 - xy_1 + y = 0$ B) $x^2 y_2 + xy_1 - y = 0$
 C) $x^2 y_2 + xy_1 + y = 0$ D) $x^2 y_2 - xy_1 - y = 0$
- iv) To find the series solution for the equation, $4(1-x)y_2 + 3y_1 + 2y = 0$, we assume the series solution as,
 A) $y = \sum_{r=0}^{\infty} a_{r+1} x^{r+1}$ B) $y = \sum_{r=0}^{\infty} a_{R+r} x^{R+r}$ C) $y = \sum_{r=0}^{\infty} a_r x^r$ D) $y = \sum_{r=0}^{\infty} a_r x^{R+r}$

b. By the method of variation of parameters, solve $\frac{d^2 y}{dx^2} + y = \frac{1}{1 + \sin x}$. (04 Marks)

c. Solve : $(2x + 3)^2 \frac{d^2 y}{dx^2} + 6(2x + 3) \frac{dy}{dx} + 6y = \log(2x + 3)$. (06 Marks)

d. Obtain the Frobenius-type series solution for the equation, $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} - y = 0$. (06 Marks)

4 a. Choose the correct answers for the following :

(04 Marks)

- i) The partial differential equation obtained from, $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$ is,
 A) $2 = xp + yq$ B) $z = xp + yq$ C) $x = xp + yq$ D) $2z = xp + yq$
- ii) The partial differential equation obtained from, $z = e^{my} \phi(x - y)$ is,
 A) $px + q = mz$ B) $p + q + mz = 0$ C) $xp + qy = mz$ D) $p + q = mz$
- iii) General solution of the equation $\frac{\partial^2 z}{\partial x \partial y} = x^2 y$ is,
 A) $\frac{x^3 y^2}{6} + f(y) + g(x)$ B) $\frac{x^3 y^2}{6} + f(y)$
 C) $\frac{x^3 y^2}{6}$ D) None of these

iv) To solve $u_{xx} - 2u_x + u_t = 0$ by the method of separation of variables, the trial solution is,

- A) $X(x)T(x)$ B) $X(x)T(t)$ C) $X(x)\sqrt{T(t)}$ D) $\sqrt{X(x)}T(t)$

b. Form a partial differential equation by eliminating the arbitrary functions f and g from the relation, $z = f(y + 2x) + g(y - 3x)$. (04 Marks)

c. Solve the equation:

$$\frac{\partial^2 z}{\partial x \partial y} + 9x^2 y^2 = \cos(2x - y) \text{ by direct integration, given that } z = 0 \text{ when } y = 0 \text{ and } \frac{\partial z}{\partial y} = 0$$

(06 Marks)

when $x = 0$.

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

PART – B

5 a. Choose the correct answers for the following :

(04 Marks)

i) The value of $\int_1^4 \int_0^{\sqrt{4-x}} xy dy dx$ is,

- A) $9/2$ B) $3/4$ C) $2/3$ D) $4/5$

ii) $\int_0^1 \int_0^2 \int_1^2 xyz^2 dx dy dz =$ _____

- A) 2 B) 3 C) 1 D) $3/2$

iii) $\int_0^\infty x^3 e^{-4x^2} dx =$ _____

- A) 21 B) 32 C) 23 D) $1/32$

iv) $\Gamma(-7/2) =$ _____

- A) $\frac{15}{32}\sqrt{\pi}$ B) $\frac{17}{46}\sqrt{\pi}$ C) $\frac{13}{55}\sqrt{\pi}$ D) $\frac{16}{105}\sqrt{\pi}$

b. Evaluate $\int_0^1 \int_x^1 \frac{x}{\sqrt{x^2+y^2}} dy dx$ by changing the order of integration. (04 Marks)c. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} \sqrt{x^2+y^2} dy dx$ by transforming to polar coordinates. (06 Marks)d. Prove that $\int_0^1 \frac{x^2}{\sqrt{1-x^4}} dx \times \int_0^1 \frac{1}{\sqrt{1+x^4}} dx = \frac{\pi}{4\sqrt{2}}$ (06 Marks)

6 a. Choose the correct answers for the following :

(04 Marks)

i) If $\vec{f} = 3xy\hat{i} - y^2\hat{j}$, then $\int_C \vec{f} \cdot d\vec{r}$ from $(0, 0)$ to $(1, 2)$ along $y = 2x^2$ is,

- A) $6/7$ B) $-7/6$ C) $7/6$ D) $-6/7$

ii) If V is the volume obtained by a closed surface S and $\vec{F}$ is a continuously differentiable vector function then $\iiint_V \text{div } \vec{F} dv =$ _____

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

iii) Greens theorem in the plane is $\int_C Mdx + Ndy$

- A) $\iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx dy$ B) $\iint_R \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right) dx dy$ C) $\iint_R \left(\frac{\partial N}{\partial x} + \frac{\partial M}{\partial y} \right) dx dy$ D) $\iint_R \left(\frac{\partial N}{\partial y} + \frac{\partial M}{\partial x} \right) dx dy$

iv) Stokes theorem is $\int_C \vec{f} \cdot d\vec{r} =$ _____

- A) $\int_S (\text{curl } \vec{f}) \cdot \hat{n} ds$ B) $\int_S (\text{div } \vec{f}) \cdot \hat{n} ds$ C) $\int_S (\text{curl } \vec{f}) \cdot \hat{n} ds$ D) None of these

b. Evaluate $\iint_S \vec{f} \cdot \hat{n} ds$ where $\vec{f} = yz\hat{i} + 2y^2\hat{j} + xz^2\hat{k}$ and S is the surface of the cylinder $x^2 + y^2 = 9$ contained in the first octant between $z = 0$ and $z = 2$. (04 Marks)c. Verify Greens theorem for, $\int_C (xy + y^2) dx + x^2 dy$, where C is the closed curve made up of the line $y = x$ and the parabola $y = x^2$. (06 Marks)d. Verify Stoke's theorem for $\vec{f} = (2x - y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ for the upper half of the sphere $x^2 + y^2 + z^2 = 1$. (06 Marks)

7 a. Choose the correct answers for the following :

- i) $L\{t^4 e^{-3t}\} = \underline{\hspace{2cm}}$
 A) $24/s^5$ B) $24/(s-3)^5$ C) $24/(s+3)^5$ D) $24/(s+4)^5$
- ii) $L\left\{\frac{1}{\sqrt{t}}\right\} = \underline{\hspace{2cm}}$
 A) $\sqrt{\pi}/s^{3/2}$ B) $-\sqrt{\pi}/s^{1/2}$ C) $\sqrt{\pi}/s^{2/3}$ D) $\sqrt{\pi}/\sqrt{s}$
- iii) $\int_0^\infty \frac{e^{-t} \sin t}{t} dt = \underline{\hspace{2cm}}$
 A) $\pi/2$ B) $\pi/4$ C) $\pi/6$ D) $\pi/3$
- iv) $L\{e^{(t-1)}H(t-1)\} = \underline{\hspace{2cm}}$
 A) $e^s/s+1$ B) $e^s/s-1$ C) $e^{-s}/s-1$ D) $e^{-s}/s+1$

b. Find the Laplace transform of $\frac{1-\cos t}{t^2}$. (04 Marks)

c. If $f(t) = \begin{cases} t & \text{for } 0 < t \leq a \\ 2a-t & \text{for } a < t < 2a \end{cases}$ is a periodic function of period $2a$, then prove that

$$L\{f(t)\} = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right). \quad (06 \text{ Marks})$$

d. Express the following function in terms of the unit step function and hence find the Laplace transform: $f(t) = \begin{cases} 1, & 0 < t \leq 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2 \end{cases}$. (06 Marks)

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

- i) $L^{-1}\left\{\frac{1}{s^{5/2}}\right\} = \underline{\hspace{2cm}}$
 A) $2t^{3/2}/\sqrt{\pi}$ B) $4t^{3/2}/\sqrt{\pi}$ C) $2t^{3/2}/3\sqrt{\pi}$ D) $4t^{3/2}/3\sqrt{\pi}$
- ii) $L^{-1}\left\{\frac{s}{s^2-2s+17}\right\} = \underline{\hspace{2cm}}$
 A) $e^t \cos 4t$ B) $\frac{1}{4}e^t \sin 4t$ C) $e^t \cos 4t + \frac{1}{4}e^t \sin 4t$ D) $e^{-t} \cos 4t + \sin 4t$
- iii) $L^{-1}\left\{\frac{se^{-\pi s}}{s^2+9}\right\} = \underline{\hspace{2cm}}$
 A) $H(t-\pi)\sin 3t$ B) $H(t-\pi)\cos 3t$ C) $H(t-\pi)\cos 9t$ D) $-H(t-\pi)\cos 3t$
- iv) The convolution of two functions $f(t)$ and $g(t)$ is defined by $f(t) * g(t) = \underline{\hspace{2cm}}$
 A) $\int_0^\infty e^{-st}f(u)du$ B) $\int_0^\infty f(u)g(t-u)du$ C) $\int_0^t f(u)g(t-u)du$ D) $\int_0^t e^{-st}g(t-u)du$

b. Find the inverse Laplace transform of $\frac{se^{-s/2} + \pi e^{-s}}{s^2 + \pi^2}$. (04 Marks)

c. Using the convolution theorem, obtain the inverse Laplace transform of $\frac{1}{(s^2 + a^2)^2}$. (06 Marks)

d. Using the Laplace transform method, solve the differential equation,

$$\frac{d^2 y}{dt^2} + 3\frac{dy}{dt} + 2y = 2t^2 + 2t + 2 \text{ under the conditions } y(0) = 2, y'(0) = 0. \quad (06 \text{ Marks})$$

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Question Paper Version : C

I / II Semester B.E Degree Examination, June/July 2015
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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

1. Who has the power to establish a common High Court for two or more states and Union Territories?
a) Supreme Court b) President c) Union Law Minister d) Parliament
2. As applied to engineering research and testing, retaining the data to draw a non-contradictory statement, discarding the rest is called,
a) Trimming b) Cooking c) Scanning d) Skimming
3. Which of the following exercised the most profound influence in framing the Indian Constitution?
a) British Constitution b) U.S. Constitution c) Irish Constitution d) The Govt. of India Act, 1935
4. Judges of the Supreme Court of India now retire at the age of,
a) 58 years b) 60 years c) 62 years d) 65 years
5. A compound measure of the probability and magnitude of adverse effect is known as,
a) Compensation b) Benefit c) Risk d) Accident
6. Which fundamental rights article is enforceable even during National Emergency?
a) Art.20 b) Art.21 c) Both (a) & (b) d) None of these
7. Conflict of interest may be,
a) Potential b) False c) Imaginary d) Created
8. A money bill passed by the Lok Sabha is deemed to have been passed by the Rajya Sabha also when no action is taken by the Rajya Sabha within,
a) 10 days b) 14 days c) 24 days d) 30 days
9. The number of members in the state legislative assemblies of Goa and Mizoram states are,
a) 40 b) 60 c) 80 d) 30

10. The preamble of the Indian Constitution resolves to secure to all its citizens,
a) Justice b) Liberty and equality c) Fraternity d) All of these
11. Which one of the following is not a Directive Principle of State Policy?
a) Maternity Relief b) Adult Education c) Improvement of Public Health d) Free legal aid to poor
12. This is not impediment to responsibility,
a) Fear b) Self deception c) Ignorance d) Self respect
13. After declaration of financial emergency by the President, what is the period of operation without approval by the Parliament?
a) Three months b) Four months c) Two months d) Indefinitely
14. This is not one of the required qualifications to be appointed as the Governor of a State.
a) Has completed the age of 35 years b) Must be an Indian Citizen
c) Must be a graduate d) Should not hold any other office of profit
15. In the Union Government the Council of Ministers is collectively responsible to the,
a) President b) Prime Minister c) Lok Sabha d) Parliament
16. Which one of the following is not a fundamental Right?
a) Right against exploitation b) Right to property
c) Right to constitutional remedies d) Cultural and Educational rights
17. One of the aims of engineering ethics is to,
a) Inspire engineers to acquire in depth knowledge in their field.
b) Stimulate the moral imagination
c) Acquire new skills in Engineering, Testing and Research
d) Make Engineers self confident in discharging their duties
18. Directive Principles, method of election of President & nomination of 12 members to Rajya Sabha by the President are adopted from the constitution of,
a) U.K. b) U.S.A c) Ireland d) Germany
19. Which Article of the Constitution empowers high courts to issue writs of various kinds?
a) Art.32 b) Art.214 c) Art.224 d) Art.226
20. Who nominates two Anglo-Indian members to the house of the people?
a) Speaker b) Prime Minister c) President d) Vice President
21. Under the Government of India Act, 1935, which communities were provided separate representation in the Electorate system?
a) Sikhs, Europeans b) Indian Christians c) Anglo-Indians d) All of these
22. Part IV of the Indian Constitution deals with _____.
a) Fundamental Duties b) Fundamental Rights c) Directive principles & state policy d) Preamble
23. Who is the Executive Head (Constitutional) of the State Government?
a) Chief Minister b) Governor c) President d) Prime Minister

24. Whose role has become significant as the Guardian of fundamental rights?
a) President b) Prime Minister c) Supreme Court and High Court d) Parliament
25. The term of members of Rajya Sabha is,
a) 5 years b) 6 years c) Same as that of Lok Sabha d) 2 years
26. Which House shall not be a subject for dissolution?
a) Lok Sabha b) Council of States c) House of the people d) State Legislative Assembly
27. The minimum age prescribed for the membership of a State Legislative Council is,
a) 25 years b) 30 years c) 35 years d) 40 years
28. Mandal commission deals with,
a) Reservation for backward classes people b) Rights of the minority
c) Laws relating to sexual harassment d) Laws relating to child labour
29. Who are not entitled to form Union/Association?
a) Entrepreneurs b) Teachers c) Police d) Students
30. "Fault Tree" is used.
a) In engineering testing b) To trace the fault in engineering work
c) To assess the accuracy of the research work d) To assess the risk
31. Which writ is issued by a High Court or the Supreme court to compel a public authority to perform a legal duty that it was not performing?
a) Writ of Certiorari b) Writ of Habeas corpus c) Writ of Mandamus d) Writ of Quo Warranto
32. The owner of "Patent Right" retains his patent right for _____ years.
a) 20 b) 50 c) 75 d) 100
33. Who are considered to be vulnerable group?
a) Scheduled castes and Scheduled tribes b) Women and Children
c) Other backward classes d) All of these
34. Unless approved by the state legislature, the ordinance issued by the Governor remains in for a maximum period of,
a) Two months b) Three months c) Six months d) One year
35. Who among the following is / are not appointed by the President of India?
a) Governors of the states b) Chief Justice and Judges of High Courts
c) Vice President d) Prime Minister
36. Which of the following Articles contain Directive Principles of state Policy?
a) Art.30 to 49 b) Art.36 to 51 c) Art.42 to 56 d) Art.28 to 48
37. "Minimalist View" means
a) A concept of responsibility b) A narrow thinking
c) A ministerial view d) A novel plan to minimize loss

38. Which article of the Indian constitution deals with the procedure of amendment of the constitution?
a) Art. 366 b) Art. 368 c) Art. 370 d) Art. 372
39. The Directive principle of state policy to be followed by the state for securing economic justice does not include.
a) To secure uniform civil code b) Equal pay for equal work for both men and women
c) To promote cottage industries d) Protection of health and strength of workers
40. The preamble of the Indian Constitution was amended during the year.
a) 1974 b) 1976 c) 1978 d) 1980
41. The fundamental duties under the Indian constitution are provided by,
a) An order of the President b) An Amendment to the constitution
c) An order of the supreme court d) An Act of the Parliament
42. “Easy Day”, “Big Bazar” and “More” are examples of,
a) Trade secret b) Patent c) Trade mark d) Copy right
43. In the final form of the constitution adopted on 26th November, 1949, how many Articles and Schedules were there?
a) 397 Articles and 9 Schedules b) 395 Articles and 8 Schedules
c) 396 Articles and 7 Schedules d) 395 Articles and 10 Schedules
44. Who is the Supreme commander of Armed Forces in India?
a) Minister of Defence b) Prime Minister of India c) President of India d) The commander-In-Chief
45. Under whose advice, President of India appoints Regional Election Commissioner?
a) Prime Minister b) Chief Election Commissioner c) Home Minister d) Chief Appointment Officer
46. One of the ways of misusing the truth is,
a) Failure to seek out the truth b) Exaggerating the truth
c) Making confused statement d) Making totally false statement
47. After Independence who decided to determine the future Constitution of India?
a) Jawahar Lal Nehru b) Sardar Vallabh Bhai Patel c) Constituent Assembly d) Mahatma Gandhi
48. The Chief Election Commissioner of India holds office for a period of,
a) Six years b) Six years or the age of 65 years which ever is early
c) During the pleasure of the President d) Three years
49. Which Constitutional Organ has the power to amend the Constitution of India?
a) Judiciary b) Executive c) Legislative d) Parliament
50. Who has the Authority to approve President’s Rule (State Emergency) in the state?
a) Parliament b) Lok Sabha c) State Legislature d) Council of states

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Question Paper Version : D

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

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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

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1. Major purpose of most of the Dams around the world is
a) Power generation b) Drinking water supply c) Flood control d) Irrigation.
 2. Which of the following statement is false
a) Soil erosion effects the productivity of agriculture fields
b) It takes 300 years for one inch of agricultural top soil to form
c) The amount of erosion depends on soil type, slope, drainage pattern and crop management practices.
d) Soil erosion help to retain water and nutrients in the root zone.
 3. Plants use _____ has for photosynthesis.
a) Oxygen b) Methane c) Nitrogen d) Carbon dioxide.
 4. The major objectives of family welfare programs in India is
a) Disease control b) population growth rate control
c) employment generation d) None of these.
 5. The first International Earth Summit was held at
a) Johannesh burg b) Rio de Janeiro c) Kyoto d) Stockholm.
 6. Wind energy generation depends on
a) Direction of wind b) Velocity of wind c) Humidity d) precipitation.
 7. Which is the source of energy that can be replaced at the same rate at which it is used?
a) Coal b) petroleum c) Oil d) Biomass.

8. Sulphur occurs in soil and rocks in the form of _____
 a) Oxides of Zn & Fe b) Sulphates of Zn & Fe c) Nitrates of Zn & Fe
 d) Sulphides of Zn & Fe
9. Solar radiation consists of
 a) UV b) Visible light c) Infrared d) All of these.
10. The most important fuel used by nuclear power plant is
 a) U - 235 b) U - 238 c) U - 245 d) U - 248.
11. The most important remedy to avoid negative impact due to industrialization is
 a) Industry should be closed b) Don't allow new Industrial units
 c) Industry should treat all the wastes generated by it before disposal
 d) Industries should be shifted far away from human habitats.
12. The permissible range of pH for drinking water as per the Indian standards is
 a) 6 to 9 b) 6.5 to 7.5 c) 6 to 8.5 d) 6.5 to 8.5.
13. Air pollution from automobiles can be controlled by fitting
 a) Electrostatic precipitator b) Wet collector (scrubber)
 c) Catalytic converter d) All the above.
14. Noise is
 a) Loud sound b) Unwanted sound c) Constant sound d) sound of high frequency
15. India's position in the Bio-gas plants globally
 a) 5th b) 2nd c) 4th d) 7th
16. Urbanization is
 a) Local environmental issue b) National environmental issue
 c) Both a) and b) d) Not at all an issue
17. Environmental protection is the fundamental duties of the citizen of India under the article.
 a) 51 - A (g) b) 48 - A c) 47 d) 21.
18. Excess of iron in water is likely to cause
 a) colour b) Taste c) hardness d) All of the above.
19. Which of the following environmental spheres has least storage capacity for matter?
 a) Atmosphere b) Lithosphere c) Hydrosphere d) Biosphere.
20. Which of the following is a biotic component of an ecosystem
 a) Fungi b) Solar light c) Temperature d) Humidity.
21. In complex ecosystem the degree of species diversity is
 a) Poor b) High c) Medium d) None.
22. The process of movement of nutrients from soil by the acid rain is
 a) Transpiration b) Evapo transpiration c) Leaching d) Infiltration

23. Ozone layer thickness is measured in
a) ppm b) ppb c) Decibels d) Dobson units.
24. Freon's are :
a) HFC b) CFC c) NFC d) Hydrocarbons.
25. The adverse effect of modern agriculture is
a) Water pollution b) Soil degradation c) Water logging d) All the above.
26. India has the largest share of which of the following?
a) Manganese b) Mica c) Copper d) Diamond.
27. Excess fluorides in drinking water is likely to cause
a) Blue babies b) Fluorosis c) taste and odour d) Intestinal irritation.
28. The primary producers in a forest ecosystem are
a) Chlorophyll containing trees and plants b) Herbivores c) Carnivores d) Bacteria.
29. Access to food is mainly determined by
a) Household income b) Food assistance programmes
c) Human resources d) Society/community.
30. Which of the following is having high population density
a) India b) China c) USA d) Western Europe.
31. Which of the following is a producer in an ecosystem
a) plant and some bacteria capable of producing their own food b) Animals
c) Human beings d) Fish.
32. The basic requirements of human beings are provided by
a) Industrialization b) Agriculture c) Nature d) Urbanization.
33. E.I.A is related to
a) Resource conservation b) Efficient equipment/process c) Waste minimization.
d) All of the above
34. Which of the following are major environmental issues involved in mining?
a) Air pollution from dust b) Water pollution c) Soil degradation d) All of the above.
35. About _____ % of the earth's surface is covered by water
a) 53% b) 19% c) 71% d) 90%
36. Major causes of deforestation are
a) Shifting cultivation b) Fuel requirements c) Raw materials for industries
d) All of these.
37. Biogas is produced by
a) Microbial activity b) Harvesting crop c) Both a) & b) d) None of the above.

38. Which of the following is not a renewable source of energy
a) Fossil fuel b) Solar energy c) Tidal wave energy d) Wind energy.
39. The major automobile pollutants include
a) Co, NO_x, Hydrocarbons & SPM b) Co, NO_x, Hydrocarbons and CH₄
c) CO₂, NO_x, Hydrocarbons & SPM d) Co, NO_x, Freon's & SPM.
40. Increase in asthma attacks has been linked to high levels of
a) Nitrogen b) Air-borne dust particles c) Oxygen d) CO.
41. Which green house gas is known as colorless, non-flammable sweetish odor and laughing gas?
a) Methane b) CO₂ c) Nitrous oxide d) sulfur hexafluoride
42. The pH value of the acid rain water is
a) 5.7 b) 7.0 c) 8.5 d) 7.5
43. Which of the following is the purpose of animal husbandry?
a) Conservation of animal husbandry b) Production of meat
c) Conservation of wildlife d) Conservation of forests.
44. Bhopal Gas tragedy caused due to leakage of
a) Methyl Iso Cyanate (MIC) b) Sulfur dioxide c) Mustard gas d) Methane.
45. Which of the following is NGO:
a) Narmada Bachao Andolan b) CPCB c) KSPCB d) None.
46. The objectives of the Wild life (protection) Act 1972 is :
a) to preserve the biodiversity b) To maintain essential ecological and life supporting system
c) Protection & conservation of wild life d) All.
47. What is the unit of measurement of sound?
a) dB b) Decibel c) Both a) & b) d) None of these.
48. B.O.D measures
a) Industrial pollution b) Air pollution c) Polluting capacity of effluents
d) D.O needed by the microbes for decomposition.
49. The Air (Prevention and control of pollution) Act was enacted in the year
a) 1981 b) 1996 c) 2000 d) 1974.
50. The central pollution control Board was established under the provision of
a) Environmental (protection) Act 1986 b) Air (prevention and control) Act 1981
c) Water (prevention and control of pollution) Act 1974 d) All of the above.

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10MAT21

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

Time: 3 hrs.

Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing at least two from each part.**2. Answer all objective type questions only on OMR sheet page 5 of the answer booklet.****3. Answer to objective type questions on sheets other than OMR will not be valued.****PART – A****1 a. Choose the correct answers for the following : (04 Marks)**

- i) The general solution for the equation, $x^2p^2 + 3xyp + 2y^2 = 0$ is,
 A) $(x - y - C)(x^2 + y^2 - C) = 0$ B) $(y - x - C)(x - y^2 - C) = 0$
 C) $(xy - C)(x^2y - C) = 0$ D) $(y - x - C)(x^2y + C) = 0$
- ii) The given differential equation is solvable for y, if it is possible to express y in terms of,
 A) x and y B) x and p C) y and p D) None of these
- iii) The singular solution of the equation, $(y - px)(p - 1) = p$ is,
 A) $y(1 + e^x) + e^x$ B) $x(1 + e^x) + e^y$ C) $y(1 + e^{-x}) + x$ D) $x(1 + e^{-x}) + e^x + 1$
- iv) Clairuts equation of $\sin px \cos y = \cos px \sin y + p$ is,
 A) $y = px - \sin^{-1} p$ B) $x = py - \cos^{-1} p$ C) $y = xp + \cos^{-1} p$ D) $x = py + \sin^{-1} p$

b. Solve : $p^2 + 2p \cot x = y^2$. (04 Marks)**c. Solve : $x^2 + p^2x = yp$. (06 Marks)****d. Solve : $y = 2px - y^2p^3$. Take $X = 2x$, $Y = y^2$. (06 Marks)****2 a. Choose the correct answers for the following : (04 Marks)**

- i) The complimentary function for the differential equation, $y'' - 6y' + 25y = 0$ is,
 A) $e^{2x}(C_1 \cos 3x + C_2 \sin 3x)$ B) $e^{-2x}(C_1 \cos 3x + C_2 \sin 3x)$
 C) $e^{3x}(C_1 \cos 4x + C_2 \sin 4x)$ D) $e^{-3x}(C_1 \cos 4x + C_2 \sin 4x)$

- ii) The displacement in the simple harmonic $\frac{d^2x}{dt^2} = -\mu^2x$ is,
 A) $C_1 \cos \mu t - C_2 \sin \mu t$ B) $C_1 \cos \mu t + C_2 \sin \mu t$
 C) $C_1 \cos \mu t \pm C_2 \sin \mu t$ D) $\cos \mu t \pm \sin \mu t$

- iii) The particular integral of $(D^2 + 4)y = \cos 2x$ is,
 A) $\frac{x \cos 2x}{4}$ B) $\frac{\cos 2x}{8}$ C) $\frac{\sin 2x}{8}$ D) $\frac{x \sin 2x}{4}$

- iv) The solution of the differential equation, $y'' + 3y' + 2y = e^{-3x}$ is,
 A) $C_1 e^{-x} + C_2 e^{2x} + \frac{1}{2} e^{-3x}$ B) $C_1 e^x + C_2 e^{-2x} + \frac{1}{2} e^{-3x}$
 C) $C_1 e^{-x} + C_2 e^{-2x} + \frac{1}{2} e^{-3x}$ D) None of these

b. Solve: $\frac{d^2y}{dx^2} + 4y = 2^{-x}$. (04 Marks)**c. Solve : $\frac{d^3y}{dx^3} + 8y = x^2 e^{-2x}$ (06 Marks)****d. Solve the system: $\frac{dx}{dt} + 2x - 3y = 5t$, $\frac{dy}{dt} - 3x + 2y = 2e^{2t}$. (06 Marks)**

3 a. Choose the correct answers for the following :

(04 Marks)

- i) The Wronskian of the differential equation, $(D + 2)^2 y = \sec 2x$ is,
 A) e^{-2x} B) 2 C) e^{4x} D) e^{-4x}
- ii) The complimentary function of the differential equation, $x^2 y'' - xy' + y = \log x$ is,
 A) $C_1 x + C_2 x \log x$ B) $C_1 x + C_2 x^2$ C) $C_1 \log x + C_2 x^2$ D) $C_1 x^2 + C_2 x \log x$
- iii) The homogeneous linear differential equation whose auxillary equation has roots 1, -1 is,
 A) $x^2 y_2 - xy_1 + y = 0$ B) $x^2 y_2 + xy_1 - y = 0$
 C) $x^2 y_2 + xy_1 + y = 0$ D) $x^2 y_2 - xy_1 - y = 0$
- iv) To find the series solution for the equation, $4(1-x)y_2 + 3y_1 + 2y = 0$, we assume the series solution as,
 A) $y = \sum_{r=0}^{\infty} a_{r+1} x^{r+1}$ B) $y = \sum_{r=0}^{\infty} a_{R+r} x^{R+r}$ C) $y = \sum_{r=0}^{\infty} a_r x^r$ D) $y = \sum_{r=0}^{\infty} a_r x^{R+r}$

b. By the method of variation of parameters, solve $\frac{d^2 y}{dx^2} + y = \frac{1}{1 + \sin x}$. (04 Marks)

c. Solve : $(2x + 3)^2 \frac{d^2 y}{dx^2} + 6(2x + 3) \frac{dy}{dx} + 6y = \log(2x + 3)$. (06 Marks)

d. Obtain the Frobenius-type series solution for the equation, $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} - y = 0$. (06 Marks)

4 a. Choose the correct answers for the following :

(04 Marks)

- i) The partial differential equation obtained from, $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$ is,
 A) $2 = xp + yq$ B) $z = xp + yq$ C) $x = xp + yq$ D) $2z = xp + yq$
- ii) The partial differential equation obtained from, $z = e^{my} \phi(x - y)$ is,
 A) $px + q = mz$ B) $p + q + mz = 0$ C) $xp + qy = mz$ D) $p + q = mz$
- iii) General solution of the equation $\frac{\partial^2 z}{\partial x \partial y} = x^2 y$ is,
 A) $\frac{x^3 y^2}{6} + f(y) + g(x)$ B) $\frac{x^3 y^2}{6} + f(y)$
 C) $\frac{x^3 y^2}{6}$ D) None of these

iv) To solve $u_{xx} - 2u_x + u_t = 0$ by the method of separation of variables, the trial solution is,

- A) $X(x)T(x)$ B) $X(x)T(t)$ C) $X(x)\sqrt{T(t)}$ D) $\sqrt{X(x)}T(t)$

b. Form a partial differential equation by eliminating the arbitrary functions f and g from the relation, $z = f(y + 2x) + g(y - 3x)$. (04 Marks)

c. Solve the equation:

$$\frac{\partial^2 z}{\partial x \partial y} + 9x^2 y^2 = \cos(2x - y) \text{ by direct integration, given that } z = 0 \text{ when } y = 0 \text{ and } \frac{\partial z}{\partial y} = 0 \text{ when } x = 0.$$

(06 Marks)

d. Solve : $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$

(06 Marks)

PART – B

5 a. Choose the correct answers for the following :

(04 Marks)

i) The value of $\int_1^4 \int_0^{\sqrt{4-x}} xy dy dx$ is,

A) $9/2$

B) $3/4$

C) $2/3$

D) $4/5$

ii) $\int_0^1 \int_0^2 \int_1^2 xyz^2 dx dy dz =$ _____

A) 2

B) 3

C) 1

D) $3/2$

iii) $\int_0^\infty x^3 e^{-4x^2} dx =$ _____

A) 21

B) 32

C) 23

D) $1/32$

iv) $\Gamma(-7/2) =$ _____

A) $\frac{15}{32}\sqrt{\pi}$

B) $\frac{17}{46}\sqrt{\pi}$

C) $\frac{13}{55}\sqrt{\pi}$

D) $\frac{16}{105}\sqrt{\pi}$

b. Evaluate $\int_0^1 \int_x^1 \frac{x}{\sqrt{x^2 + y^2}} dy dx$ by changing the order of integration. (04 Marks)c. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} y^2 \sqrt{x^2 + y^2} dy dx$ by transforming to polar coordinates. (06 Marks)d. Prove that $\int_0^1 \frac{x^2}{\sqrt{1-x^4}} dx \times \int_0^1 \frac{1}{\sqrt{1+x^4}} dx = \frac{\pi}{4\sqrt{2}}$ (06 Marks)

6 a. Choose the correct answers for the following :

(04 Marks)

i) If $\vec{f} = 3xy\hat{i} - y^2\hat{j}$, then $\int_C \vec{f} \cdot d\vec{r}$ from (0, 0) to (1, 2) along $y = 2x^2$ is,

A) $6/7$

B) $-7/6$

C) $7/6$

D) $-6/7$

ii) If V is the volume obtained by a closed surface S and $\vec{F}$ is a continuously differentiable vector function then $\iiint_V \text{div } \vec{F} dv =$ _____

A) 0

B) $\iint_S \vec{F} \times \hat{n} ds$

C) $\iint_S \vec{F} \cdot \hat{n} ds$

D) None of these

iii) Greens theorem in the plane is $\int_C Mdx + Ndy$

A) $\iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx dy$

B) $\iint_R \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right) dx dy$

C) $\iint_R \left(\frac{\partial N}{\partial x} + \frac{\partial M}{\partial y} \right) dx dy$

D) $\iint_R \left(\frac{\partial N}{\partial y} + \frac{\partial M}{\partial x} \right) dx dy$

iv) Stokes theorem is $\int_C \vec{f} \cdot d\vec{r} =$ _____

A) $\int_S (\text{curl } \vec{f}) \cdot \hat{n} ds$

B) $\int_S (\text{div } \vec{f}) ds$

C) $\int_S (\text{curl } \vec{f}) \cdot \hat{n} ds$

D) None of these

b. Evaluate $\iint_S \vec{f} \cdot \hat{n} ds$ where $\vec{f} = yz\hat{i} + 2y^2\hat{j} + xz^2\hat{k}$ and S is the surface of the cylinder $x^2 + y^2 = 9$ contained in the first octant between $z = 0$ and $z = 2$. (04 Marks)c. Verify Greens theorem for, $\int_C (xy + y^2) dx + x^2 dy$, where C is the closed curve made up of the line $y = x$ and the parabola $y = x^2$. (06 Marks)d. Verify Stoke's theorem for $\vec{f} = (2x - y)\hat{i} - yz^2\hat{j} - y^2z\hat{k}$ for the upper half of the sphere $x^2 + y^2 + z^2 = 1$. (06 Marks)

7 a. Choose the correct answers for the following :

- i) $L\{t^4 e^{-3t}\} =$ _____
 A) $24/s^5$ B) $24/(s-3)^5$ C) $24/(s+3)^5$ D) $24/(s+4)^5$
- ii) $L\left\{\frac{1}{\sqrt{t}}\right\} =$ _____
 A) $\sqrt{\pi}/s^{3/2}$ B) $-\sqrt{\pi}/s^{1/2}$ C) $\sqrt{\pi}/s^{2/3}$ D) $\sqrt{\pi}/\sqrt{s}$
- iii) $\int_0^{\infty} \frac{e^{-t} \sin t}{t} dt =$ _____
 A) $\pi/2$ B) $\pi/4$ C) $\pi/6$ D) $\pi/3$
- iv) $L\{e^{(t-1)}H(t-1)\} =$ _____
 A) $e^s/s+1$ B) $e^s/s-1$ C) $e^{-s}/s-1$ D) $e^{-s}/s+1$

b. Find the Laplace transform of $\frac{1-\cos t}{t^2}$. (04 Marks)

c. If $f(t) = \begin{cases} t & \text{for } 0 < t \leq a \\ 2a-t & \text{for } a < t < 2a \end{cases}$ is a periodic function of period $2a$, then prove that

$$L\{f(t)\} = \frac{1}{s^2} \tanh\left(\frac{as}{2}\right). \quad (06 \text{ Marks})$$

d. Express the following function in terms of the unit step function and hence find the Laplace transform: $f(t) = \begin{cases} 1, & 0 < t \leq 1 \\ t, & 1 < t \leq 2 \\ t^2, & t > 2 \end{cases}$. (06 Marks)

8 a. Choose the correct answers for the following :

(04 Marks)

- i) $L^{-1}\left\{\frac{1}{s^{5/2}}\right\} =$ _____
 A) $2t^{3/2}/\sqrt{\pi}$ B) $4t^{3/2}/\sqrt{\pi}$ C) $2t^{3/2}/3\sqrt{\pi}$ D) $4t^{3/2}/3\sqrt{\pi}$
- ii) $L^{-1}\left\{\frac{s}{s^2-2s+17}\right\} =$ _____
 A) $e^t \cos 4t$ B) $\frac{1}{4}e^t \sin 4t$ C) $e^t \cos 4t + \frac{1}{4}e^t \sin 4t$ D) $e^{-t} \cos 4t + \sin 4t$
- iii) $L^{-1}\left\{\frac{se^{-\pi s}}{s^2+9}\right\} =$ _____
 A) $H(t-\pi)\sin 3t$ B) $H(t-\pi)\cos 3t$ C) $H(t-\pi)\cos 9t$ D) $-H(t-\pi)\cos 3t$
- iv) The convolution of two functions $f(t)$ and $g(t)$ is defined by $f(t)*g(t) =$ _____
 A) $\int_0^{\infty} e^{-st}f(u)du$ B) $\int_0^{\infty} f(u)g(t-u)du$ C) $\int_0^t f(u)g(t-u)du$ D) $\int_0^t e^{-st}g(t-u)du$

b. Find the inverse Laplace transform of $\frac{se^{-s/2} + \pi e^{-s}}{s^2 + \pi^2}$. (04 Marks)

c. Using the convolution theorem, obtain the inverse Laplace transform of $\frac{1}{(s^2 + a^2)^2}$. (06 Marks)

d. Using the Laplace transform method, solve the differential equation,

$$\frac{d^2 y}{dt^2} + 3\frac{dy}{dt} + 2y = 2t^2 + 2t + 2 \text{ under the conditions } y(0) = 2, y'(0) = 0. \quad (06 \text{ Marks})$$

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