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10MAT11

First Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Mathematics – I

Time: 3 hrs.

Max. Marks:100

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

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

i) If $y = \frac{1}{2x+1}$ then the 10^{th} derivative of y is

A) $\frac{2^{10}10!}{(-2x+1)^{11}}$ B) $\frac{2^{10}10!}{(2x+1)^{11}}$ C) $\frac{2^{10}10!}{(2x-1)^{11}}$ D) $\frac{2^{10}10!}{(2x+1)^{-11}}$

ii) If $y = \sin 2x$ then y_n is

A) $2^n \sin\left(2x + \frac{n\pi}{2}\right)$ B) $2^n \cos\left(2x + \frac{n\pi}{2}\right)$ C) $2^n \sin\left(2x - \frac{n\pi}{2}\right)$ D) none of these

iii) If $f(x)$ is continuous in $[a, b]$, differentiable in (a, b) and $f(a) = f(b)$, then there exist atleast one point $c \in (a, b)$ such that $f'(c)$ is equal to

A) 0 B) -1 C) $\frac{f(b)-f(a)}{b-a}$ D) $\frac{f(b)-f(a)}{a-b}$

iv) Maclaurin's series expansion of e^x is

A) $1 + 2x + \frac{x^2}{2} + \dots$ B) $1 + x + \frac{x^2}{2} + \dots$ C) $1 - 2x + \frac{x^2}{2} - \dots$ D) $1 - x + \frac{x^2}{2} - \dots$

b. If $\cos^{-1}\left(\frac{y}{b}\right) = \log\left(\frac{x}{n}\right)^p$, prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2 + p^2)y_n = 0$. (06 Marks)

c. State Rolle's theorem and verify the theorem for the function $f(x) = \log\left(\frac{x^2 + ab}{x(a+b)}\right)$ in $[a, b]$, $b > a > 0$. (05 Marks)

d. Find the Maclaurin's series expansion of $\log(1+e^x)$ upto the term containing x^4 . (05 Marks)

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

i) The value of $\lim_{x \rightarrow 0} \frac{a^x - b^x}{x}$ is

A) $\log\left(\frac{b}{a}\right)$ B) $\log\left(\frac{a}{b}\right)$ C) $\log(a-b)$ D) 1

ii) Angle between radius vector and tangent to the curve $r = a \sin \theta$ is

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

iii) The radius of curvature of any point on the curve $x = a \cos \theta$ and $y = a \sin \theta$ is

A) $a \sin \theta$ B) θ C) $\frac{\theta}{2}$ D) a

iv) The derivative of arc length $\frac{ds}{d\theta}$ for the polar curve $r = f(\theta)$ is

A) $\sqrt{r^2 + \frac{d^2 r}{d\theta^2}}$ B) $\sqrt{r + \left(\frac{dr}{d\theta}\right)^2}$ C) $\sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2}$ D) $\sqrt{r^2 + \left(\frac{d\theta}{dr}\right)^2}$

b. Evaluate the following:

i) $\lim_{x \rightarrow 0} (1+x)^{1/x}$ ii) $\lim_{x \rightarrow 0} \frac{(1+x)^{1/x} - e}{x}$ (06 Marks)

c. For the curve $y = \frac{ax}{a+x}$, if ρ is the radius of curvature at any point (x, y) , show that

$$\left(\frac{2\rho}{a}\right)^{\frac{2}{3}} = \left(\frac{y}{x}\right)^2 + \left(\frac{x}{y}\right)^2. \quad (05 \text{ Marks})$$

d. Find the angle of intersection of the following pair of curves $r = a \log \theta$, $r = \frac{a}{\log \theta}$.

(05 Marks)

3 a. Choose the correct answers for the following :

(04 Marks)

i) If $u = ax^2 + by^2 + abxy$, then $\frac{\partial^3 u}{\partial x^2 \partial y}$ is

- A) zero B) $a + b + ab$ C) ab D) none of these

ii) If $u = x^4 y^5$, where $x = t^2$ and $y = t^3$, then $\frac{du}{dt}$ is

- A) $22 t^{23}$ B) $20 t^{19}$ C) $9 t^8$ D) $23 t^{22}$

iii) If $x = r \cos \theta$ and $y = r \sin \theta$ then $\frac{\partial(x, y)}{\partial(r, \theta)}$ is

- A) $r^2 \sin 2\theta$ B) r^2 C) r D) $r \sin 2\theta$

iv) The necessary condition for $u = f(x, y)$ to be extremal is

- A) $u_x \neq 0, u_y \neq 0$ B) $u_x = 0, u_y = 0$ C) $u_x > 0, u_y > 0$ D) $u_x < 0, u_y < 0$

b. If $u = x + 3y^2 - z^3$, $v = 4x^2 yz$, $w = 2xz^2 - xy$, prove that $\frac{\partial(u, v, w)}{\partial(x, y, z)}$ at $(1, -1, 0)$ is 20.

(06 Marks)

c. If $z = \cos(x + ay) + \sin(x - ay)$ prove that $\frac{\partial^2 z}{\partial y^2} = a^2 \frac{\partial^2 z}{\partial x^2}$.

(05 Marks)

d. The deflection at the centre of a rod of length ℓ and diameter d , supported at its ends and located at the centre a weight w , which varies as $w \ell^3 d^4$. Determine the percentage increase in w, ℓ and d of 5, 4 and 3 respectively.

(05 Marks)

4 a. Choose the correct answers for the following :

(04 Marks)

i) If $\vec{F} = 3x^2 \hat{i} - xy \hat{j} + (a-3)xz \hat{k}$ is solenoidal, then a is

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

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

- A) $2x \hat{i} + 2y \hat{j} + 2z \hat{k}$ B) 0 C) $\frac{x \hat{i} + y \hat{j} + z \hat{k}}{2}$ D) $2x + 2y + 2z$

iii) If $\phi = xy + yz + zx$, then $\text{grad } \phi$ at $(1, 1, 1)$ is

- A) $2 \hat{i} + 2 \hat{j} + 2 \hat{k}$ B) 0 C) $\hat{i} + \hat{j} + \hat{k}$ D) $3 \hat{i} + 3 \hat{j} + 3 \hat{k}$

iv) The gradient of a scalar field is a

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

b. If $\vec{F} = (x + y + z) \hat{i} + \hat{j} - (x + y) \hat{k}$ then show that $\vec{F} \cdot \text{curl } \vec{F} = 0$.

(06 Marks)

c. If $\vec{F} = \nabla(x^3 + y^3 + z^3 - 3xyz)$ then prove that $\vec{F}$ is irrotational.

(05 Marks)

d. Derive an expression for $\text{div } \vec{F}$ in orthogonal curvilinear coordinates.

(05 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) The Leibnitz's rule for differentiation under the integral sign is
- A) $\phi'(y) = \int_a^b \frac{\partial}{\partial y} [f(x, y)] dx$ B) $\phi'(y) = \int_a^b \frac{\partial}{\partial x \partial y} [f(x, y)] dx$
- C) $\phi(y) = \int_a^b \frac{\partial}{\partial x} [f(x, y)] dx$ D) none of these
- ii) The value of $\int_0^{\pi/2} \sin^6 x dx$ is
- A) $\frac{5\pi}{8}$ B) $\frac{5\pi}{64}$ C) $\frac{5\pi}{32}$ D) $\frac{5\pi}{16}$
- iii) The value of $\int_0^{\pi/2} \sin^5 x \cos^5 x dx$ is
- A) $\frac{1}{90}$ B) $\frac{1}{60}$ C) $\frac{1}{30}$ D) $\frac{1}{70}$
- iv) Surface area of a solid of revolution of the curve $y = f(x)$, if rotated about x-axis is
- A) $\int_{x=a}^b 2\pi y dx$ B) $\int_{x=a}^b 2\pi x dy$ C) $\int_{x=a}^b 2\pi y ds$ D) $\int_{x=a}^b 2\pi x ds$
- b. Using the rule of differentiation under the integral sign, evaluate $\int_0^{\pi} \frac{\log(1 + \alpha \cos x)}{\cos x} dx$. (06 Marks)
- c. Obtain the reduction formula for $\int_0^{\pi/2} \cos^n x dx$. (05 Marks)
- d. Find the area of the Cardioid $r = a(1 + \cos \theta)$. (05 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) The solution of $\frac{dy}{dx} + \frac{y}{x} = 0$ is
- A) $\frac{y}{x} = c$ B) $\frac{x}{y} = c$ C) $x - y = c$ D) $xy = c$
- ii) The orthogonal trajectory of the family of lines $y = ax$ is
- A) $x^2 + y^2 = c^2$ B) $x^2 - y^2 = c^2$ C) $xy = c$ D) $\frac{x}{y} = c$
- iii) The solution of the differential equation $\frac{dy}{dx} = 1 + \frac{y}{x}$ is
- A) $y = \log x + c$ B) $y = x \log x + c$ C) $y = x(\log x + c)$ D) none of these
- iv) The general solution of the differential equation $(x - y)dx - (x + y)dy = 0$ is
- A) $\frac{x^2}{2} - y - \frac{y^2}{2} = c$ B) $\frac{x^2}{2} - y + \frac{y^2}{2} = c$ C) $\frac{x^2}{2} - yx + \frac{y^2}{2} = c$ D) none of these
- b. Solve $\frac{dy}{dx} = \frac{y}{x + \sqrt{xy}}$. (06 Marks)
- c. Solve $x \log x \frac{dy}{dx} + y = 2 \log x$. (05 Marks)
- d. Find the orthogonal trajectories of the family $x^{2/3} + y^{2/3} = a^{2/3}$.

7 a. Choose the correct answers for the following :

i) The system of equations $AX = B$ is consistent if

A) $\rho(A) = \rho([A : B])$

B) $\rho(A) = \rho(B)$

C) $\rho(A) = \rho([B : A])$

D) all of these

ii) The system of equations $AX = 0$ is always

A) inconsistent

B) consistent

C) both A and B

D) none of these

iii) Which of the following is in the normal form

A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

B) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

C) $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$

D) all of these

iv) The rank of the matrix $\begin{bmatrix} 41 & 42 & 43 \\ 42 & 43 & 44 \\ 43 & 44 & 45 \end{bmatrix}$ is

A) 0

B) 2

C) 1

D) 3

b. Reduce the matrix $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ into its normal form and hence find its rank.

(06 Marks)

c. Find the value of λ such that the system $2x - y + \lambda z = 0$, $3x + 2y + (\lambda - 2)z = 0$, $x - 4y + 5z = 0$ has non-trivial solution and hence solve the system for λ . (05 Marks)

d. Solve $x + y + z = 1$, $4x + 3y - z = 6$, $3x + 5y + 3z = 4$ by Gauss Jordan method. (05 Marks)

8 a. Choose the correct answers for the following :

(04 Marks)

i) The eigen values of the matrix A exists, if A is a

A) rectangular matrix

B) any matrix

C) null matrix

D) square matrix

ii) The eigen values of the matrix $A = \begin{bmatrix} 2 & 4 \\ 1 & 5 \end{bmatrix}$ are

A) 1, 3

B) 1, 6

C) 1, 5

D) 1, 4

iii) Which of these is in quadratic form

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

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

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

D) both A and C

iv) The quadratic form $(X'AX)$ is positive definite if

A) All the eigen values of A > 0

B) Atleast one eigen value of A is > 0

C) All eigen values are > 0 and atleast one eigen value is 0

D) No such condition

b. Reduce the matrix $A = \begin{bmatrix} -1 & 2 \\ 2 & -1 \end{bmatrix}$ to diagonal form. Hence find A^6 .

(06 Marks)

c. Show that the linear transformation $y_1 = 2x_1 + x_2 + x_3$, $y_2 = x_1 + x_2 + 2x_3$, $y_3 = x_1 - 2x_3$ is regular write down the inverse transformation. (05 Marks)

d. Reduce the quadratic form $3x^2 - 2y^2 - z^2 + 12yz + 8zx - 4xy$ to canonical form and indicate its nature, rank, index and signature. (05 Marks)

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10CHE12/22

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Choose the correct answers for the following :
 - i) The electrode with –ve sign for its SRP acts as,

A) Anode with respect to SHE	B) Cathode with respect to SHE
C) Act as both	D) None of these.
 - ii) The emf of a concentration cell with 0.05m & 0.025m AgNO_3 solution is

A) 0.178V	B) 0.0295V	C) 0.0178V	D) 0.125V
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 - iii) For a galvanic cell with spontaneous reaction, E_{cell} is assigned.

A) +ve sign	B) – ve sign	C) Zero	D) None of these
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 - iv) Example of an ion selective electrode is

A) S.H.E	B) Platinum electrode
C) Glass electrode	D) Ag-AgCl electrode.

(04 Marks)
 - b. What is single electrode potential? Derive Nernst equation for the same. **(06 Marks)**
 - c. A galvanic cell is constructed by immersing a Cu rod in $\text{Cu(NO}_3)_2$ solution of 0.01 M and a silver rod in AgNO_3 solution of 0.1M ionic concentrations. Given E^0 of the cell is 0.46V. Write the cell diagram cell reaction and calculate the emf of the cell. **(04 Marks)**
 - d. Explain the application of glass electrode in determination of pH of a solution. **(06 Marks)**
- 2 a. Choose the correct answers for the following :
 - i) The electrolyte used in Zn – Air battery is

A) Aqueous H_2SO_4	B) Aqueous KOH	C) concentrate KCl	D) None of these.
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 - ii) Which of the followings is a modern battery?

A) Zn – Air cell	B) Zn – MnO_2 cell	C) Lead – Acid cell	D) None.
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 - iii) Fuel cell is an electrochemical cell, which works,

A) In absence of fuel	B) with continuous consumption of fuel
C) Without an electrolyte	D) None of these.
 - iv) The operation temperature of alkaline fuel cell is

A) 600°C	B) 60 - 80°C	C) 1000°C	D) 250°C
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(04 Marks)
 - b. Discuss the following battery characteristics.

i) Capacity	ii) Energy efficiency	iii) Shelf life.
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(06 Marks)
 - c. With a neat sketch, explain the construction and working of lead – Acid storage battery with discharging and recharging reactions. **(06 Marks)**
 - d. What are fuel cells? How it differ from battery? **(04 Marks)**
- 3 a. Choose the correct answers for the following :
 - i) Corrosion occurs in metal in a corrosive environment due to

A) Deposition of metal	B) Oxidation of metal
C) Reduction of metal	D) None of these.
 - ii) In acidic medium, the corrosion reaction ends with

A) Liberation of N_2	B) Absorption of O_2	C) Liberation of H_2	D) Absorption of H_2
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- iii) Coating of Zn on iron is known as
 A) Galvanization B) tinning C) Cathodic protection D) None of these.
- iv) Water line corrosion is an example of
 A) differential aeration cell B) stress corrosion
 C) Galvanic corrosion D) None of these. (04 Marks)
- b. What is electro chemical corrosion? Discuss the electro chemical theory of corrosion by taking the iron as example. (06 Marks)
- c. Discuss the effect of the following on rate of corrosion.
 i) Nature of oxide film ii) polarization. (06 Marks)
- d. Explain the sacrificial anodic method of corrosion control. (04 Marks)
- 4 a. Choose the correct answers for the following :
- i) The electro chemical cell used for electroplating is
 A) Fuel cell B) Galvanic cell C) Electrolytic cell D) None.
- ii) The decomposition potential refers to,
 A) Minimum current a cell uses B) Minimum voltage to be applied
 C) Minimum concentration to be maintained D) None of these.
- iii) The reducing agent used in electroless plating of copper is
 A) Formaldehyde B) sodium hypophosphite
 C) Acetic acid D) Formic acid.
- iv) Electro less plating involves the deposition
 A) without the use of current B) By using the current
 C) By applying voltage and current D) None of the above. (04 Marks)
- b. What is metal finishing? Discuss the effect of over voltage and decomposition potential on electroplating. (06 Marks)
- c. Discuss the electroplating of chromium. (05 Marks)
- d. What is electroless plating? Discuss the electroless plating of copper. (05 Marks)

PART – B

- 5 a. Choose the correct answers for the following :
- i) The quantity of heat evolved by the complete combustion of unit quantity of fuel in air or oxygen is
 A) Calorific value B) Enthalpy C) Free energy D) None.
- ii) The process of breaking down of high molecular mass hydrocarbon to low molecular mass hydrocarbon is
 A) Refining B) Reforming C) Cracking D) None.
- iii) The octane number of fuel is measure of
 A) Ability to resist anti knocking B) offers no resistance to knocking
 C) Ability to resist knocking D) None of the above.
- iv) The device in which electricity is produced using solar energy is known as
 A) Fuel cell B) Voltaic cell C) Photovoltaic cells D) None. (04 Marks)
- b. Explain the Bomb calorimetric method of the determination of the calorific value of the fuel. (05 Marks)
- c. Explain the fluidized bed catalytic cracking. (06 Marks)
- d. Calculate the G.C.V and NCV of a fuel from the following data :
 Mass of fuel burnt: 0.75g; Mass of water taken = 1150g; water equivalent of calorimeter: 350g, Increase in temp = 3.02°C percentage of hydrogen in fuel is 2.8. (05 Marks)

- 6 a. Choose the correct answers for the following :
- The phase rule for heterogeneous system is
 A) $C = P + 2 - F$ B) $P + F = C + 2$ C) $C + F = P + 2$ D) $C + P = F + 2$
 - The number of components in water system is
 A) 1 B) 3 C) 2 D) 0
 - The composition of an eutectic of lead and silver is
 A) 5g Ag 95% pb B) 1.5g Ag 98.5g pb C) 2.67g Ag 97.33 pb D) None.
 - Mathematical expression of Beers and Lambert's law.
 A) $I_t = I_0 \cdot e^{-\text{ect}}$ B) $I_0 = I_t \cdot e^{-\text{ect}}$ C) $I_t = I_0 \cdot e^{-\text{ec}}$ D) $I_t = I_0 \cdot e^{\text{Ect}}$
- (04 Marks)
- b. Discuss the applications of phase rule to water system. (05 Marks)
- c. What is reduced phase rule? Describe the phase diagram of lead silver system. (05 Marks)
- d. Explain the conducto metric titrations. (06 Marks)
- 7 a. Choose the correct answers for the following :
- A polymer formed by direct addition of repeated monomers without elimination of bye product is
 A) condensation polymer B) Addition polymer
 C) conducting polymer D) Elastomer
 - An example of natural polymer is
 A) Plastic B) Rubber C) Nylon D) P.V.C.
 - Teflon is obtained by the polymerization of
 A) Tetra fluoro ethane B) Isoprene C) Butadiene D) None.
 - Phenol formaldehyde is a
 A) Thermosetting polymer B) Thermoplastic
 C) Co-polymer D) None of these.
- (04 Marks)
- b. Discuss the mechanism of addition polymerization by taking ethylene as example. (05 Marks)
- c. Give the synthesis, properties and uses of the followings:
- Neoprene ii) P.M.M.A.
- (06 Marks)
- d. Explain the conduction mechanism in poly acetylene. (05 Marks)
- 8 a. Choose the correct answers for the following :
- The process of removing salts from sea water is called
 A) Desalination B) Sedimentation C) Precipitation D) None of these.
 - A treatment involving the removal of phosphate is
 A) Primary B) Secondary C) Tertiary D) All of these.
 - Permanent hardness of water is due to
 A) CaCl_2 and MgCl_2 B) CaCO_3 C) MgCO_3 D) None of these.
 - Potassium chromate is used as an indicator in determination.
 A) Hardness B) alkalinity C) Cl^- ions D) F^- ions.
- (04 Marks)
- b. Explain the estimation of alkalinity of water. (05 Marks)
- c. Calculate COD of effluent of sample when 25cm^3 of effluents requires 8.3cm^3 of $0.001\text{ M K}_2\text{Cr}_2\text{O}_7$ for complete oxidation. (05 Marks)
- d. Discuss the reverse osmosis method of water purification. (06 Marks)

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First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Engineering Physics

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, choosing at least two from each part.**2. Physical constants: $h = 6.63 \times 10^{-34} \text{ JS}$, $C = 3 \times 10^8 \text{ m/s}$, $e = 1.6 \times 10^{-19} \text{ C}$,** **$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$, $m_e = 9.1 \times 10^{-31} \text{ kg}$, $m_n = 1.674 \times 10^{-27} \text{ kg}$, $NA = 6.025 \times 10^{26} / \text{Kmol}$.****PART – A**

- 1 a.** Choose the correct answers for the following : (04 Marks)
- The wavelength (λ) associated with a particle of mass m , moving with a velocity v is given by
 A) $\lambda = \frac{h}{mv}$ B) $\lambda = \frac{hv}{m}$ C) $\lambda = \frac{mv}{h}$ D) $\lambda = \frac{m}{hv}$
 - In black body radiation spectrum, the Wein's distribution law is applicable for
 A) Longer wavelength B) Shorter wavelength
 C) Entire wavelength D) None of these
 - If the group velocity of particle is $4.7 \times 10^6 \text{ m/s}$, then its phase velocity is
 A) $6 \times 10^9 \text{ m/s}$ B) $4.7 \times 10^9 \text{ m/s}$ C) $9.4 \times 10^6 \text{ m/s}$ D) $1.91 \times 10^{10} \text{ m/s}$
 - Photo electric effect establishes
 A) Wave nature of light B) Particle nature of light
 C) Dual nature of light D) None of these
- b.** What is Planck's radiation law? Show how Wein's law and Rayleigh-Jean's law can be derived from it. (06 Marks)
- c.** Describe Davisson and Germer experiment for the justification of de Broglie waves. (06 Marks)
- d.** Find the energy of neutrons in eV whose de Broglie wavelength is $1 \text{ \AA}$. Given the mass of neutron is $1.674 \times 10^{-27} \text{ kg}$. (04 Marks)
- 2 a.** Choose the correct answers for the following : (04 Marks)
- The product of uncertainties between position and momentum is given by
 A) $\Delta x \Delta p \geq \lambda$ B) $\Delta x \Delta p \geq \frac{h}{4\pi}$ C) $\Delta x \Delta p \geq mv$ D) $\Delta x \Delta p \geq \frac{nh}{2\pi}$
 - The energy corresponding to the first permitted energy level is given by
 A) Excited energy B) Metastable state energy
 C) Zero point energy D) None of these
 - The wave function is acceptance wave function if it is
 A) Finite every where B) Continuous everywhere
 C) Single valued everywhere D) All of these
 - If the electron moves in one dimensional potential box of length 2 nm , the normalization constant is
 A) $1(\text{nm})^{-1/2}$ B) $2(\text{nm})^{-1}$ C) $[\sqrt{2} \text{ nm}]^{-1}$ D) None of these.
- b.** Using time independent Schrodinger wave equation obtain the expression for the normalized wave function for a particle in one dimensional potential well of infinite height. (08 Marks)
- c.** Explain Heisenberg's uncertainty principle. (04 Marks)
- d.** An electron is confined to a box of length 10^{-9} m , calculate the minimum uncertainty in its velocity. (04 Marks)

- 3 a. Choose the correct answers for the following : (04 Marks)
- The free electrons in classical free electron theory are treated as
A) Rigidly fixed lattice points B) Liquid molecules
C) Gas molecules D) None of these
 - If the mobility of electrons in a metal increases, the resistivity
A) Increases B) Decreases C) Remains constant D) None of these
 - Matthiessen's rule is given by
A) $\rho = \rho_{ph} - \rho_i$ B) $\rho = \frac{\rho_{ph}}{\rho_i}$ C) $\rho = \rho_{ph} + \rho_i$ D) $\rho = \frac{\rho_i}{\rho_{ph}}$
 - The value of Fermi function in Fermi level at $T \neq 0K$ is,
A) ZERO B) 0.5 C) 0.75 D) 1
- b. Using the classical free electron theory, derive an expression for electrical conductivity in metals. (06 Marks)
- c. Define Fermi energy and Fermi factor. Discuss the variation of Fermi factor with temperature. (06 Marks)
- d. Calculate the conductivity of sodium given $\tau_m = 2 \times 10^{-14}s$. Density of sodium is 971 kg/m^3 , its atomic weight is 23 and has one conduction electron per atom. (04 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- The electric dipole moment per unit volume is
A) Magnetization B) Bipole moment
C) Electric polarization D) Electric susceptibility
 - For Ferromagnetic substances, the Curie-weiss law is
A) $\psi = \frac{C}{T}$ B) $\psi = \frac{C}{T - \theta}$ C) $\psi = \frac{T - \theta}{C}$ D) $\frac{C}{T + \theta}$
 - The relation between B, M and H is
A) $H = \mu_0 (M + B)$ B) $B = \mu_0 (H + M)$ C) $M = \mu_0 (H + B)$ D) None of these
 - In the inverse piezoelectric effect
A) Ultrasonic waves are produced B) Electromagnetic waves are produced
C) Microwaves are produced D) None of these
- b. What is internal field? Derive an expression for the internal field in the case of one dimensional array of atoms in dielectric solids. (07 Marks)
- c. Distinguish between hard and soft magnetic materials. (05 Marks)
- d. Sulphur is elemental solid dielectric whose dielectric constant is 3.4. Calculate the electronic polarizability if its density is $2.07 \times 10^3 \text{ kg/m}^3$ and atomic weight is 32.07. (04 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- Wavelength of LASER can be used as a standard of
A) Time B) Temperature C) Length D) Angle
 - The lifetime of atoms in meta stable state is of the order of
A) Milliseconds B) Microseconds C) Nanoseconds D) Unlimited
 - Which of these is not a LASER property?
A) Highly monochromatic B) Highly divergent
C) Highly directional D) Highly intense
 - Pumping technique used in semiconductor LASER is
A) Electrical discharge B) Forward bias C) Optical pumping D) None of these
- b. Describe the construction and working of He-Ne LASER. (07 Marks)
- c. What is holography? Explain the principle of recording of hologram with suitable diagrams. (05 Marks)
- d. The ratio of population of two energy levels is $1,059 \times 10^{-30}$. Find the wavelength of light emitted at 330K. (04 Marks)

- 6 a. Choose the correct answers for the following : (04 Marks)
- The NA of an optical fiber is 0.2, when surrounded by air. The acceptance angle when it is in water of refractive index 1.33 is
A) 8.21° B) 8.65° C) 0.11° D) None of these
 - Superconductors are
A) Ferromagnetic B) Paramagnetic C) Anti Ferromagnetic D) Diamagnetic
 - Below critical temperature, if the temperature of superconductor is increased, the critical field
A) Increases B) Decreases
C) Remains constant D) First increases, then decreases
 - Attenuation in optical fiber is due to
A) Absorption B) Scattering C) Radiation loss D) All the above
- b. Discuss various types optical fibers with suitable diagrams. (06 Marks)
- c. Write a note on Maglev vehicles. (05 Marks)
- d. The refractive indices of the core and cladding of a step index fiber are 1.45 and 1.40 respectively and its core diameter is $45\mu\text{m}$. Calculate its relative refractive index difference, V-number at wavelength 1000nm and the number of modes. (05 Marks)
- 7 a. Choose correct answers for the following : (04 Marks)
- The relation between atomic radius R and its lattice constant ' a ' in FCC is
A) $a = 2R$ B) $a = 2\sqrt{2}R$ C) $a = \frac{\sqrt{3}}{4}R$ D) $a = \frac{\sqrt{3}}{2}R$
 - The coordination number in the case of BCC is
A) 6 B) 8 C) 10 D) 12
 - A plane intercepts at $a, b/2, 2c$ in a simple cubic cell. The miller indices of the plane are.
A) (214) B) (241) C) (421) D) (124)
 - Bragg's equation is expressed as
A) $2d\sin\theta = n\lambda$ B) $2a\sin\theta = n\lambda$ C) $2\sin\theta = n\lambda$ D) None of these
- b. What is atomic packing factor? Calculate APF in the case of BCC and FCC. (06 Marks)
- c. What are miller indices of planes? Explain how to find the miller indices of planes with an example. (06 Marks)
- d. A monochromatic X-ray beam of wavelength $1.5\text{\AA}$ undergoes 2nd order Bragg reflection from the plane (211) of a cubic crystal at a glancing angle of 54.38° . Calculate the lattice constant. (04 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- The elastic behavior of the liquid is characterized by its
A) Young's modulus B) Modulus of rigidity
C) Bulk modulus D) Poisson's ratio
 - The state of the matter around nanosize is known as
A) Liquid state B) Plasma state C) Mesoscopic state D) Solid state
 - A bulk material reduced to one dimension is called quantum
A) Dot B) Well C) Particle D) Wire
 - The frequency of ultrasonic waves is
A) $< 20\text{kHz}$ B) Between 20Hz and 20kHz
C) $> 20\text{kHz}$ D) None of these
- b. What are nanomaterials? Explain any two methods of preparation of nanomaterials with neat sketches and mention any one application. (08 Marks)
- c. Describe a method of measuring velocity of ultrasonic waves in solids. Using this how can we find the rigidity modulus of the solid? (08 Marks)

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10CCP13/23

First/Second Semester B.E. Degree Examination, June/July 2016
Computer Concepts and 'C' Programming

Time: 3 hrs.

Max. Marks:100

Note: 1. Answer any FIVE full questions, choosing at least two from each part.
2. Use of steam tables is not permitted.

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
 - i) Which of the following is not a type of computer based on individual usage?
 - A) Desktop computer
 - B) Workstation
 - C) Digital computer
 - D) Smart phone
 - ii) Note book computer is also called as _____.
 - A) PDA's
 - B) Laptops
 - C) Smart phones
 - D) Tablet computer
 - iii) Display system in table computer can be rotated by _____.
 - A) 60°
 - B) 120°
 - C) 90°
 - D) 180°
 - iv) One Terabyte = _____.
 - A) 1024 GB
 - B) 1024 MB
 - C) 1024 KB
 - D) 1024 bytes
 - b. Explain briefly the basic structure of a computer along with a block diagram. (06 Marks)
 - c. Explain the different types of audiovisual input devices. (10 Marks)
-
- 2 a. Choose the correct answers for the following : (04 Marks)
 - i) The capacity of a floppy disk is _____.
 - A) 2.44 MB
 - B) 1.44 MB
 - C) 2.48 MB
 - D) 2.48 MB
 - ii) Which of the following is an example of system software?
 - A) MS - WORD
 - B) Microsoft excel
 - C) Text editor
 - D) Payroll
 - iii) In star topology the central computer is called
 - A) Host
 - B) Source
 - C) Hub
 - D) None
 - iv) 1 byte = _____ Nibbles.
 - A) 4
 - B) 2
 - C) 8
 - D) 1
 - b. Explain how the data is organized in magnetic disk. (04 Marks)
 - c. What is Operating system? Explain the types of operating system. (08 Marks)
 - d. Mention the need for networking. (04 Marks)
-
- 3 a. Choose the correct answers for the following : (04 Marks)
 - i) Which of the following command is used to save the program?
 - A) F3
 - B) Cntrl + V
 - C) F2
 - D) Cntrl
 - ii) Which of the following is a newline character?
 - A) \t
 - B) \f
 - C) \b
 - D) \n
 - iii) _____ format specifier converts the data into floating point value.
 - A) %e
 - B) %o
 - C) %d
 - D) %u
 - iv) Which input function accept the string as input from the keyboard?
 - A) getchar ()
 - B) gets ()
 - C) getch ()
 - D) getche ()
 - b. Explain the basic data types available in C language. (08 Marks)
 - c. Explain the formatted Input and Output function with example. (08 Marks)
-
- 4 a. Choose the correct answers for the following : (04 Marks)
 - i) Which of the following operator is R → L associativity.
 - A) <
 - B) +
 - C) ^
 - D) =

- ii) What is the output of the following statement `printf ("%d\n", 12,345, 678);`
 A) 12 B) 12 C) 12,345 D) 12,345, 678
- iii) An expression with only one operand but not any operator is called ____
 A) Primary B) Ternary C) unary D) Binary
- iv) If $i = 3$, $j = 4$, what is the value of $j + 1 / i - 1$.
 A) 2 B) 1 C) 4 D) 3
- b. Simplify the expression $a + = b * = C - = 5$, where $a = 1$, $b = 3$, $c = 7$. (04 Marks)
- c. Write a C program to find the area of a triangle given the 3 sides. (06 Marks)
- d. Explain the increment and decrement operator with program. (06 Marks)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) Which of the following header file is used if we use `floor ( )` function :
 A) `stdio.h` B) `conio.h` C) `math.h` D) `stdlib.h`
- ii) Which element of user defined function is not terminated by semicolon (;)
 A) function prototype B) function definition
 C) function call D) function declaration
- iii) Pass by value is also called as ____
 A) call by value B) call by reference
 C) function call D) function declaration
- iv) ____ type of variable is accessible through out the program
 A) local variable B) global variable
 C) static variable D) register variable
- b. Explain briefly the different methods of passing parameter. (10 Marks)
- c. Write a C program to compute cube of a given number using functions. (06 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) The complement of $<$ is ____
 A) $> =$ B) $< =$ C) $>$ D) $= =$
- ii) What is the output of the following program segment

```
#include<stdio.h>
Void main ( )
{
  int i = 10 ;
  while (0)
  {
    Printf ("%d", i);
  }
}
```

 A) 0 B) 10
 C) No output D) 0 is displayed ∞ times
- iii) Which of the following is valid :
 A) Case 4 : B) Case "4" : C) Case $i + 2$: D) Case 'choice' :
- iv) Which of the following loop is used when we do not know exactly how many times a set of statements have to be repeatedly executed.
 A) for B) while C) do while D) switch
- b. Write a C program to find the roots of quadratic equation. (08 Marks)
- c. Differentiate between while and do while loop with example. (08 Marks)

- 7 a. Choose the correct answers for the following : (04 Marks)
- Array always starts from index ____
A) 1 B) -1 C) 0 D) 2
 - Linear search is also called as ____
A) Binary search B) Sequential search
C) Traversal D) Sort
 - The string "0" occupies ____ bytes
A) 2 byte B) 1 byte C) 4 byte D) 8 byte
 - In a variable length string, string always ends with a delimiter
A) POS B) POS - 1 C) NULL D) NULL + 1
- b. Explain briefly the declaration and initialization of one dimensional array. (08 Marks)
- c. Write a C program to count vowels and constants in a given string. (08 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- SET 1 stands for
A) Search for extra terrestrial intelligence
B) Search for extra topology intelligence
C) Search for extraordinary terrestrial intelligence
D) Search for extra typical intelligence
 - The concept of sharing of memory by various threads in program is called ____
A) sharing memory B) shared memory
C) sequential memory D) sorting memory
 - Which of the following directive is not used during synchronization of tasks
A) barrier directive B) include directive
C) ordered directive D) flush directive
 - Which of the function returns non zero value if dynamic adjustment is enable
A) void Omp – get – dynamic (int dynamic _ thread)
B) int Omp – get – dynamic ()
C) void Omp – get – nested (int nested)
D) int Omp – get – nested ()
- b. What is Thread? Explain the logical memory model of a thread. (10 Marks)
- c. What are the various motivating factors of Parallel programs? (06 Marks)

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First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017

Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs.

Max. Marks: 100

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

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
 - i) A branch of civil engineering that deals with testing soils and foundation design is called.
 - A) structural engineering
 - B) geotechnical engineering
 - C) environmental engineering
 - D) highway engineering
 - ii) Highways which are superior to national highways and are provided wherever volume of traffic is very high are :
 - A) airways
 - B) express ways
 - C) road ways
 - D) district roads
 - iii) A bascule bridge is a
 - A) floating bridge
 - B) arch bridge
 - C) suspension bridge
 - D) movable bridge
 - iv) Shoulders are the components of
 - A) bridges
 - B) buildings
 - C) roads
 - D) dams.
- b. Write a note on role of civil engineer in infrastructure development of a Nation. (08 Marks)
- c. Explain any four types of dams with sketches. (08 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
 - i) Forces whose line of action lie along the same line
 - A) coplanar non-concurrent
 - B) coplanar parallel
 - C) collinear
 - D) concurrent
 - ii) An object with only mass but no size in mechanics is
 - A) rigid body
 - B) point body
 - C) particle
 - D) deformable body
 - iii) Effect of a force on a body depends on
 - A) direction
 - B) magnitude
 - C) position
 - D) all of these
 - iv) The translators effect of a couple on the rigid body is
 - A) zero
 - B) maximum
 - C) minimum
 - D) none of these.
- b. State the law of transmissibility of force. (02 Marks)
- c. A circular disc of radius 1 m is acted upon by four forces as shown in Fig. 2(c). Replace the forces by equivalent force couple system at O. (06 Marks)

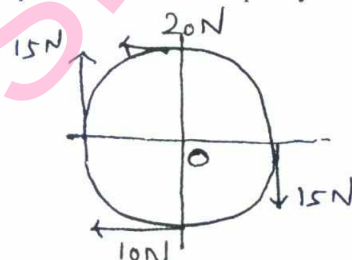


Fig. Q2(c)

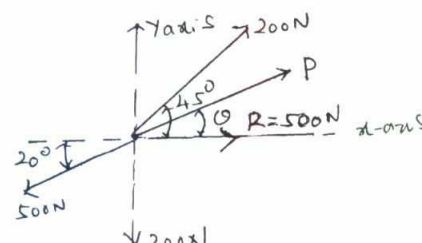


Fig. Q2(d)

- d. The four coplanar forces acting at a point are as shown in Fig. Q2(d). One of the forces is unknown and its magnitude is shown by P. The resultant is 500 N and is along x-axis. Determine the forces P and its inclination θ with x-axis. (08 Marks)

3 a. Choose the correct answers for the following :

(04 Marks)

- The technique of finding the resultant of a system of forces is called
A) resultant B) resolution C) composition D) equilibrium
 - If two concurrent forces each P act at right angles to each other, their resultant will be equal to
A) $2\sqrt{P}$ B) $P\sqrt{2}$ C) $4P$ D) P
 - Varignon's theorem is applicable to
A) only coplanar force system B) only concurrent force system
C) only non concurrent force system D) coplanar, concurrent and non-concurrent systems
 - In a coplanar concurrent system if $\sum H = 0$ then the resultant is
A) horizontal B) vertical C) moment D) none of these.
- b. State and prove Varignon's theorem of moments. (08 Marks)
- c. Find the magnitude, direction and distance of the resultant from the point A for the system of forces shown in Fig. Q3(c). (08 Marks)

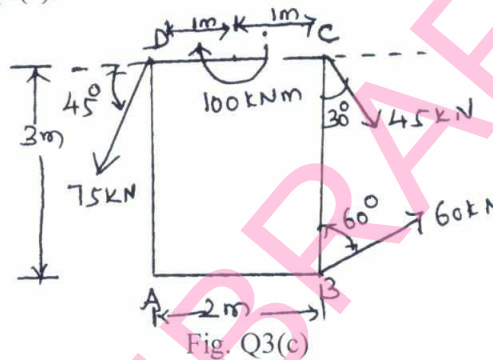


Fig. Q3(c)

4 a. Choose the correct answers for the following :

(04 Marks)

- Moment of total area about its centroidal axis
A) twice the area B) three times the area C) zero D) none of these
 - Centroid of plane is the point at which
A) weight of the body is concentrated
B) Mass of the body is concentrated
C) surface area of the body is concentrated
D) all of these
 - Centroid of a rectangle of base width b and depth d is
A) $b/3$ and $d/3$ B) $b/2$ and $d/2$ C) $b/4$ and $d/4$ D) none of these
 - Centroid of a quarter of a circular lamina lies from diameter line at a distance of
A) $4R/3\pi$ B) $R\pi/3$ C) $2R/3\pi$ D) none of these.
- b. Show that the centroid of a semi circle is at a distance of $4R/3\pi$ from the diametral axis. (06 Marks)
- c. Locate the centroid for the Fig.Q4(c) with respect to point O. (10 Marks)

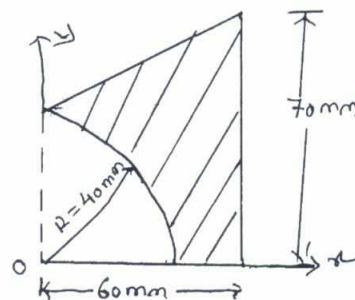


Fig. Q4(c)

PART – B

- 5 a. Choose the correct answers for the following : (04 Marks)
- A free body diagram is a diagram
 - drawn by free hand
 - separating the body from its surrounding and replacing with force vector
 - represents of a floating body
 - all of these
 - If a body is in equilibrium it is concluded that
 - no force is acting
 - resultant is zero
 - moment about any point is zero
 - both B and C
 - The Lami's theorem can be applied only when number of unknown forces are
 - two
 - three
 - five
 - none of these
 - The force which is equal and opposite to the resultant is
 - resultant force
 - force
 - equilibrant
 - none of these.
- b. Find the tension in the strings for the Fig. Q5(b). (06 Marks)

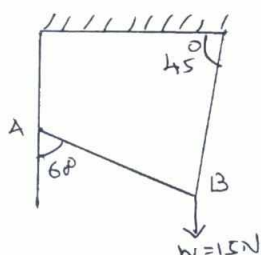


Fig. Q5(b)

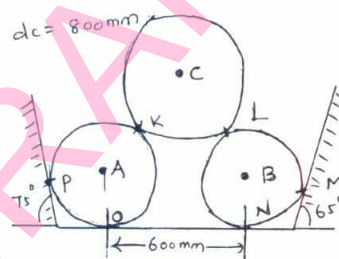


Fig. Q5(c)

- c. Determine the reaction at contact points for spheres A, B and C shown in Fig. Q5(c). Take $W_A = W_B = 4 \text{ kN}$, $W_C = 6 \text{ kN}$, $d_A = d_B = 500 \text{ mm}$, $d_C = 800 \text{ mm}$. (10 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- Statically determinate beams are
 - The beams which can be analyzed completely, using static equations of equilibrium
 - the beams which can be analyzed without using static equations of equilibrium
 - fixed beams
 - none of these
 - Water in a tank is an example of
 - point load
 - UDL
 - UVL
 - none of these
 - Reaction line at roller support with respect to plane of contact is
 - oblique
 - perpendicular
 - inclined
 - none of these
 - At fixed end of cantilever, the number of unknown reaction components are
 - 1
 - 2
 - 3
 - 4
- b. Explain different types of supports with sketches. (06 Marks)
- c. Determine the support reactions for the beam shown in Fig. 6(c). (10 Marks)

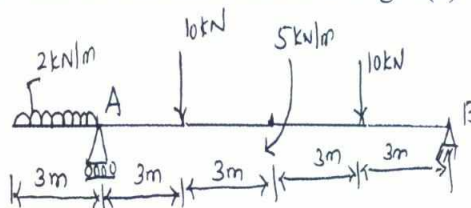


Fig. Q6(c)

7 a. Choose the correct answers for the following :

(04 Marks)

- i) The coefficient of friction depends on
 - A) area of contact
 - B) roughness of contact surface ;
 - C) both A and B
 - D) none of these
 - ii) The maximum frictional force developed when the body just begins to slide is called
 - A) limiting friction
 - B) rolling friction
 - C) static friction
 - D) none of these
 - iii) Angle of friction is angle between
 - A) normal reaction and frictional force
 - B) normal reaction and resultant
 - C) weight of the body and friction force
 - D) normal reaction and weight of the body
 - iv) Compared to static friction, dynamic friction is
 - A) larger
 - B) equal
 - C) smaller
 - D) none of these
- b. Explain with sketches : i) cone of friction ii) angle of repose. (06 Marks)
- c. An 8 m long uniform ladder weighing 500 N is resting on a rough horizontal floor and inclined at angle of 30° with the vertical wall Fig. Q7(c). A man weighing 750 N climbs the ladder. At what position will he induce slipping? The coefficient of friction between the ladder and the wall is 0.3 and that between the ladder and floor is 0.2. (10 Marks)

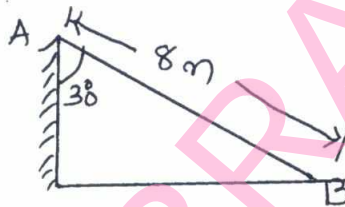


Fig. Q7(c)

8 a. Choose the correct answers for the following :

(04 Marks)

- i) The moment of inertia of an area about an axis which is perpendicular to the plane is called
 - A) radius of Gyration
 - B) polar moment of inertia
 - C) second moment of area
 - D) none of the above
 - ii) If I_a is moment of inertia of a rectangle about its centroidal axis and I_{AB} is 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 the above
 - iii) Moment of inertia of a square of side 'B' about its centroidal axis is
 - A) $B^4/8$
 - B) $B^4/12$
 - C) $B^4/36$
 - D) $B^4/48$
 - iv) M.I of hollow circular section whose external diameter is 8 mm and internal diameter is 4 mm about centroidal axis is
 - A) 437.5 mm^4
 - B) 337.5 mm^4
 - C) 237.5 mm^4
 - D) 188.4 mm^4
- b. State and prove parallel axis theorem. (06 Marks)
- c. Find the polar radius of gyration for the area shown in Fig. Q8(c) through the centroid. (10 Marks)

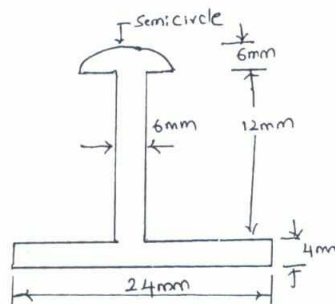


Fig. Q8(c)

First/Second Semester B.E. Degree Examination, Dec.2016/Jan.2017
Basic Electronics

Time: 3 hrs.

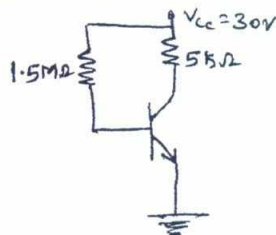
Max. Marks:100

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

PART – A

- 1 a. Choose the correct answers for the following : (04 Marks)
- When a diode is heavily doped
 - the leakage current will be low
 - the depletion region will be thin
 - A high reverse voltage applied to a junction diode will cause an effect known as
 - Punch through
 - Avalanche breakdown
 - Diffusion
 - Saturation.
 - Zener diode regulates only when it is connected in
 - forward bias
 - No bias
 - Short
 - Reverse bias.
 - An ideal diode is having _____ forward resistance.
 - zero
 - medium
 - high
 - none of these.
 - For a full wave rectifier circuit with two diodes, derive the current expression for
 - average value
 - rms value
 - Ripple factor
 - efficiency
 - PIV. (10 Marks)
 - Design a voltage regulator using zener diode to meet the following specifications :
 Dc unregulated input is 20V, $V_o = 10V$, load current is 0-20mA, $I_{2min} = 10mA$, $I_{2max} = 100mA$. (06 Marks)
- 2 a. Choose the correct answers for the following : (04 Marks)
- The arrow on the emitter of a transistor indicates
 - the direction of electron flow
 - the ground connection
 - the positive voltage point
 - the negative voltage point
 - When a transistor is used as an amplifier, it is normally operated in ----- region.
 - Saturation
 - cut off
 - active
 - diffusion.
 - The relation for α_{dc} in terms of β_{dc} is
 - $\alpha_{dc} = \frac{1 + \beta_{dc}}{\beta_{dc}}$
 - $\alpha_{dc} = \frac{1 - \beta_{dc}}{\beta_{dc}}$
 - $\alpha_{dc} = \frac{\beta_{dc}}{1 - \beta_{dc}}$
 - $\alpha_{dc} = \frac{\beta_{dc}}{1 + \beta_{dc}}$
 - Find I_E of a transistor with $I_c = 5.25mA$ and $I_B = 100\mu A$
 - 5.53mA
 - 5.35mA
 - 6.35mA
 - 4.53mA
- b. Draw the PNP transistor circuit in CB configuration. Sketch the output characteristics. Indicate active, saturation and cutoff regions. Briefly explain the nature of these curves. (10 Marks)
- c. For the CE circuit shown in Fig Q2(c). Draw the dc load line and mark the dc operating point on it Assume $\beta = 100$ and neglect V_{BE} . (06 Marks)

Fig Q2(c)



- 3 a. Choose the correct answers for the following : (04 Marks)
- The biasing circuit, which gives most stable operating points is
A) Fixed B) Collector C) Emitter D) Voltage divider
 - The stability factor (s) for a given transistor is
A) $S = \frac{\Delta I_C}{\Delta I_{CBO}}$ B) $S = \frac{\Delta I_{CBO}}{\Delta I_C}$ C) $S = \frac{1}{\Delta I_{CBO}}$ D) $S = \frac{\Delta I_B}{\Delta I_{CBO}}$
 - The voltage divider biasing circuit is also called as
A) Self Bias B) Emitter current Bias
C) Both A and B D) None of these.
 - In a transistor with normal bias, the emitter junction is
A) High resistance B) No bias C) Reverse biased D) Forward biased.
- b. With neat circuit diagram, explain the working of an base bias circuit transistor and its design procedure. (08 Marks)
- c. A voltage divider bias circuit with $V_{CC} = 20V$ and $R_C = 6k\Omega$ uses a transistor with $\beta = 80$, calculate suitable resistor values to give $V_{CE} = 8V$, $V_E = 5V$. Assume $V_{BE} = 0.7V$. (08 Marks)
- 4 a. Choose the correct answers for the following :
- A Silicon controlled Rectifier is a _____ layer device
A) Two B) Three C) Four D) None of these.
 - The region between peak point and valley point in VI characteristics of UJT is called ____
A) cut off region B) active region
C) Negative resistance region D) Saturation region.
 - When JFET is operated above pinch off voltage its drain current.
A) Becomes zero B) Starts decreasing
C) Increases sharply D) Becomes constant.
 - The function of gate in SCR is to control the
A) voltage regulation B) Flow of current
C) voltage amplification D) All of these. (04 Marks)
- b. Draw and explain and VI characteristics of SCR. (08 Marks)
- c. Draw the typical drain characteristics of P-channel JFET and indicate various regions and explain. (08 Marks)

PART – B

- 5 a. Choose the correct answers for the following :
- The advantages of negative feedback is
A) to stabilize the voltage gain B) to increase the bandwidth
C) to reduce phase shift distortion D) All of these.
 - In case of RC phase shift oscillator, the RC network produces a phase shift of
A) 90° B) 270° C) 180° D) 360°
 - The objective of using a crystal oscillator is to get
A) 50 to 70Hz B) stable frequency
C) Variable frequency D) none of these.
 - Which of the following oscillator is used to generate high frequencies?
A) RC phase shift B) Wein bridge
C) L.C oscillator D) Colpitts oscillator. (04 Marks)
- b. With a neat circuit diagram, explain the working of a two stage capacitor coupled CE amplifier. (08 Marks)
- c. With a neat circuit diagram, explain the working of Hartley oscillator. State the condition for oscillations. (08 Marks)

- 6 a. Choose the correct answers for the following :
- The common mode rejection ratio of an ideal op-amp is
A) zero B) low C) high D) infinite
 - The differential amplifier has
A) one input and one output B) two inputs and two outputs
C) two inputs and one output D) one input and two outputs
 - converts physical quantity to electrical signal
A) Amplifier B) Transducer C) Modulator D) Transmitter.
 - What is the output voltage of an inverting amplifier, if the input voltage is 0.2V and $R_1 = 20K\Omega$, $R_f = 200K\Omega$.
A) 2V B) -10V C) 20V D) -2V (04 Marks)
- b. Draw the following circuits using inverting op-amp and derive its output voltage
i) Adder ii) Integrator. (10 Marks)
- c. Draw the block diagram of a CRO and explain the function of each block. (06 Marks)
- 7 a. Choose the correct answers for the following : (04 Marks)
- The expression for modulation index in terms of carrier power and total power in an AM wave is
A) $m_a = \sqrt{2\left(\frac{p_t}{p_c} - 1\right)}$ B) $m_a = \sqrt{2\left(\frac{p_t}{p_c} - 1\right)^2}$ C) $m_a = \sqrt{\left(\frac{p_t}{p_c} - 1\right)}$ D) None of these.
 - What is the 2's complement value of $15_{(16)}$
A) 0001 B) 0000 C) 0100 D) 1000.
 - The Hexadecimal number A9, its equivalent value in binary
A) 10011010 B) 10101001 C) 10001001 D) 10100101.
 - $35_{(10)} + 26_{(8)}$ in binary is
A) 001101 B) 111001 C) 110010 D) 100100.
- b. Explain the need for modulation. (04 Marks)
- c. A carrier of 1MHz with 400w of power is amplitude modulated with a sinusoidal signal of 2500Hz. The depth of modulation is 75% calculate the sideband of frequency bandwidth and power in sidebands and total power in modulated wave (06 Marks)
- d. Solve the following :
- $[0.7642]_{10} = \text{-----}_{(2)}$
 - $[AD6CB]_{16} = \text{-----}_{(8)}$
 - $[11011.1011]_2 = \text{-----}_8$
 - Add $(BCD)_{16}$ to $(F89)_{16}$
 - Subtract using 8's complement method $66_{(8)} - 64_{(8)}$
 - Subtract using 1's complement method $1010.001_{(2)} - 100.11_{(2)}$ (06 Marks)
- 8 a. Choose the correct answers for the following : (04 Marks)
- NAND gate is a combination of ----- and -----.
A) AND and OR B) OR and NOT C) AND and NOT D) None of these.
 - A logic gate is having ----- Number of inputs.
A) 1 B) 2 C) 3 D) 1 or more
 - For which gate, when the two inputs A and B are equal the output is one and otherwise zero.
A) AND B) NOT C) EX-NOR D) EX-OR
 - Simplified form of Boolean expression $(A+B) \cdot (A+C)$ is
A) $AB+C$ B) $\bar{A} + BC$ C) $A+BC$ D) $A+B+C$.
- b. Draw the logic circuit for full adder and write its truth table with expression. (08 Marks)
- c. Simply the following Boolean expressions and realize them using NAND gates.
- $F(X, Y, Z) = X\bar{Y}\bar{Z} + \bar{X}\bar{Y}Z + \bar{X}Y + X\bar{Y}$
 - $F(X, Y, Z) = \overline{(X + \bar{Y}Z)(\bar{X} + \bar{Y} + \bar{Z})(\bar{X} + Y)}$ (08 Marks)

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First/Second Semester B.E Degree Examination, Dec.2016/Jan.2017

Environmental Studies

(COMMON TO ALL BRANCHES)

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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

1. The study of interactions between living organisms and environment is called as,
a) Ecosystem b) Ecology c) Phytogeography d) Phytosociology
2. The short term properties of the atmosphere at a given place and time is referred as,
a) Climate b) Microclimate c) Season d) Weather
3. Common energy source in Indian villages is,
a) Electricity b) Coal c) Sun d) Wood and animal dung.
4. Fossil fuels and metallic minerals are,
a) Renewable resources b) In exhaustible resources
c) Non-renewable resources d) None of these
5. Bath power and manure is provided by,
a) Nuclear plants b) Thermal plants c) Biogas plants d) Hydroelectric plants
6. Deforestation generally decreases,
a) Rainfall b) Soil erosion c) Drought d) Global warming
7. Chipko movement was started to conserve,
a) Forest b) Grass land c) Deserts d) Soil

8. Terrace farming is practiced in,
a) Coastal areas b) Deserts c) Hills d) Plains
9. Which ecological pyramid is always straight?
a) Pyramid of biomass b) Pyramid of numbers
c) Pyramid of energy d) Pyramid of numbers and biomass.
10. Increases in fauna and decrease in flora would be harmful due to increase in,
a) Diseases b) CO₂ c) O₂ d) Radioactive pollution
11. Tropical forest occurs in India in,
a) Jammu and Kashmir b) Rajasthan c) Kerala and Assam d) No where
12. If all the plants of the earth die suddenly all the animals die due to deficiency of ,
a) Food b) Shade c) Oxygen d) Shelter
13. In our country the percentage of land under forest is about,
a) 20% b) 19% c) 25% d) 30%
14. The area reserved for the welfare of wildlife is called,
a) National park b) Botanical garden c) Sanctuary d) Forest
15. Acid rain is caused by increase in the atmospheric concentration of,
a) Ozone and dust b) SO₂ and NO₂ c) SO₃ & CO d) CO₂ & CO
16. Gas leaked in Bhopal tragedy was,
a) Potassium isothiocyanate b) Sodium isothiocyanate
c) Ethyl isocyanate d) Methyl isocyanate
17. Ozone layer of upper atmosphere is being destroyed by,
a) Sulphur dioxide b) Photochemical oxidants
c) Chlorofluorocarbon d) Smog
18. Dysentery spread due to,
a) Food adulteration b) Humid weather
c) Water pollution d) Air pollution
19. Maximum deposition of DDT will occur in,
a) Phytoplankton b) Crab
c) Eel d) Sea gull
20. Disease caused by eating fish inhabiting mercury contaminated water is,
a) Bright's disease b) Minamata diseases
c) Hashimoto disease d) Osteosclerosis
21. Fluoride pollution mainly affects,
a) Kidney b) Brain c) Heart d) Teeth

22. Which of the following is not a greenhouse gas?
a) Oxygen b) CO₂ c) Chlorofluorocarbons d) Methane
23. Study of trends in human population growth and prediction of future growth is called,
a) Demography b) Biography c) Kalography d) Psychology
24. The number of babies produced per thousand individuals is called,
a) Natality b) Mortality c) Immigration d) Emigration
25. A pesticide/insecticide which has reported to cause physical deformities and disease in infants in Karnataka and Kerala state recently is,
a) Endosulfan b) DDT c) Amitraz d) None of these
26. The highest concentration of people with HIV infection have been recorded from,
a) USA b) India c) China d) Africa
27. Vasectomy is the method of sterilization in,
a) Man b) Woman c) Both Man and Woman d) None of these
28. ICDS is a welfare scheme for,
a) Public b) Women c) Men d) Children
29. The common pollutants present in ponds and pools nearby agricultural fields are,
a) Dust b) Straw c) Pollons d) Chemical fertilizer & pesticide
30. The non-green plants which obtains food from other plants are called,
a) Hosts b) Parasites c) Saprophytes d) Insectivorous plants
31. The liquid wastes from bathroom and kitchens are called,
a) Sullage b) Domestic sewage c) Storm water d) Runoff
32. EIA is abbreviated form for,
a) Energy impact assessment b) Ecological impact assessment
c) Environmental impact assessment d) Emission impact assessment
33. The fossil fuel which cause maximum environmental pollution due to its use in generation of thermal power is,
a) Coal b) Oil c) Natural gas d) None of these
34. Most stable ecosystem is,
a) Forest b) Desert c) Ocean d) Mountains
35. What is the pH range of drinking water,
a) 6 to 9 b) 6.5 to 8.5 c) 6 to 8.5 d) 6.5 to 7.5
36. Biogas is mostly made of,
a) Hydrogen b) Carbon dioxide c) ethane d) Methane

37. Which of the following is not a natural disaster:
 a) Cyclone b) Nuclear explosion c) Earthquake d) Volcano
38. Which state is having highest women illiteracy rate in India?
 a) Karnataka b) Punjab c) Rajasthan d) Kerala
39. The percentage of water accounted by oceans and seas is,
 a) 90% b) 87% c) 97% d) 99%
40. Which of the is not a biodegradable pollutant?
 a) Plastic b) Skins of vegetables and fruits c) Dry leaves d) Paper
41. The concept of BOD comprises of _____?
 a) Biochemical oxygen demand b) Usually less than C.O.D
 c) A measure of the organic matter present in waste water d) All of these
42. Environmental (protection) act was enacted in the year,
 a) 1986 b) 1992 c) 1984 d) 1974
43. Which of the following devices is most suitable for removal of gaseous pollutant?
 a) Cyclonic separator b) Fabric filter
 c) Electrostatic precipitator d) Wet collector
44. ISO14000 standard deals with,
 a) Pollution management b) Risk management
 c) Environmental management d) None of these
45. Sound becomes hazardous when noise pollution at _____ decibels.
 a) above 30 b) above 80 c) above 100 d) above 120
46. A major nitrogen storage reservoir is,
 a) River b) Atmosphere c) Oceans d) Trees
47. Hydrological cycle mainly involves,
 a) Air and Water b) Sun and Water c) Animal and Water d) Mountain and Water
48. Khetri (Rajasthan) is famous for,
 a) Gold mines b) Copper mines c) Granite stone d) Marble stone
49. Cauvery water dispute is in between,
 a) India and Pakistan b) Punjab and Haryana
 c) Uttar Pradesh and Madhya Pradesh d) Karnataka and Tamilnadu
50. National park concerned with rhinoceros is,
 a) Corbett b) Ranthambore c) Kaziranga d) Valley of flower

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I / II Semester B.E Degree Examination, Dec.2016/Jan.2017

**CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS
(COMMON TO ALL BRANCHES)**

Time: 2 hrs.]

[Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

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

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1. The system of Dyarchy was introduced for the first time by the
 - a) Government of India Act, 1858
 - b) Indian Councils Act, 1909
 - c) Government of India Act, 1919
 - d) Government of India Act, 1935.
 2. The emergency provisions of the Indian Constitution are adopted from the Constitution of
 - a) U.S.A
 - b) Germany
 - c) Canada
 - d) Russia.
 3. Which of the following Articles contain Fundamental Rights?
 - a) Article 12 to 35
 - b) Article 15 to 39
 - c) Article 30 to 45
 - d) Article 19 to 29.
 4. Since when India became a republic?
 - a) 15th August, 1947
 - b) 26th November, 1949.
 - c) 26th January, 1950
 - d) 1st January, 1949.
 5. This word was not added to the Preamble of the Indian Constitution by 42nd Constitution Amendment Act.
 - a) Socialist
 - b) Republic
 - c) Secular
 - d) Integrity.
 6. Fundamental Rights have been classified into
 - a) Five groups
 - b) Six groups
 - c) Seven groups
 - d) Four groups.
 7. Dr. B.R. Ambedkar termed Article 32 of the Indian Constitution as the "Heart and Soul of the Indian Constitution". Which one of the following fundamental right it contains?
 - a) Right to freedom
 - b) Right to Constitutional remedies
 - c) Right against exploitation
 - d) Right to freedom of religion.
 8. Cultural and Educational Rights have been incorporated under Fundamental Rights with the objective
 - a) To preserve Indian culture
 - b) To eradicate illiteracy
 - c) To evolve a single culture
 - d) To help minorities to conserve their culture

9. Under the Constitution, the power to issue a writ of Habeas Corpus is vested in
 - a) High Courts alone
 - b) Supreme Court alone
 - c) Both Supreme Court and High Court
 - d) All Courts down to the District Courts
10. Right to property, according to Constitution of India is a
 - a) Fundamental Right
 - b) Directive principle
 - c) Legal Right
 - d) Social Right
11. Which part of the Indian Constitution deals with the Directive Principles of State Policy?
 - a) Part III
 - b) Part IV
 - c) Part V
 - d) Part VI.
12. Which of the following Directive Principles is based on Gandhian ideology?
 - a) Equal pay for equal work of both men and women
 - b) Protection of children from exploitation
 - c) Securing for all people right to work
 - d) Promotion of cottage industries.
13. The main purpose of including the Directive Principles of State Policy in the Indian Constitution is to
 - a) Establish a Welfare state
 - b) Establish a Secular state
 - c) Check the arbitrary action of the Government
 - d) Establish a religious state.
14. The Directive Principles of State Policy are
 - a) Non - Justiceable
 - b) Partly Justiceable
 - c) Always Justiceable
 - d) Justiceable.
15. Which one of the following is not a Directive Principle of State Policy?
 - a) Improvement of Public health
 - b) Prohibiting the slaughter of cows and calves
 - c) Free legal aid to poor
 - d) Provisions for Adult Education.
16. Which one among the following is not a fundamental duty?
 - a) Safeguarding public property
 - b) Avoid corruption
 - c) Abide by the Constitution
 - d) Developing scientific temper
17. The total number of Fundamental duties of Indian citizens are
 - a) 10
 - b) 11
 - c) 12
 - d) 15
18. Members of Rajya Sabha are elected by
 - a) Members of Lok Sabha
 - b) Members of Legislative council
 - c) Members of Legislative Assembly
 - d) Adult Franchise
19. How many members represent Union Territories in Lok Sabha?
 - a) 20
 - b) 21
 - c) 22
 - d) 25
20. President of India is an integral part of
 - a) Lok Sabha only
 - b) Rajya Sabha only
 - c) Parliament
 - d) Union Council of Ministers.
21. The Supreme Court of India is
 - a) Under the Prime Minister
 - b) Under the President
 - c) Under the Parliament
 - d) Independent.
22. Who among the following gives advice to the President of India?
 - a) Council of Ministers with the Prime Minister at the head
 - b) Lok Sabha Speaker
 - c) Chief Justice of India
 - d) Chairman of Rajya Sabha.

23. The Constitutional and Executive head of the State is
 - a) Chief Minister
 - b) President of India
 - c) Governor of the State
 - d) Prime Minister of India.
24. How many Anglo – Indians are nominated by the Governor to the State Legislative Assembly?
 - a) Two
 - b) Three
 - c) One
 - d) Five.
25. In which of the following States Legislature consists of two houses (Bi – Cameral)?
 - a) Gujarat
 - b) Rajasthan
 - c) Bihar
 - d) Punjab.
26. The State Council of Ministers are collectively responsible to the
 - a) Chief Minister
 - b) Governor
 - c) State Legislative Assembly
 - d) State Legislative Council.
27. The Chief Justice and other Judges of High courts continue in office until they attain the age of
 - a) 60 years
 - b) 62 years
 - c) 58 years
 - d) 65 years
28. Article 21A – Right to education as a Fundamental Right was added to the Indian Constitution by
 - a) 42nd Amendment Act
 - b) 44th Amendment Act
 - c) 86th Amendment Act
 - d) None of these.
29. Proclamation of National Emergency under Article 352 is issued by the
 - a) Prime Minister
 - b) President of India
 - c) Home Minister
 - d) Defence Minister.
30. State Emergency proclamation under Article 356 shall be approved by the Parliament within a period of
 - a) 6 months
 - b) 4 months
 - c) 3 months
 - d) 2 months
31. The Chief Election Commissioner of India is appointed by the
 - a) President
 - b) Prime Minister
 - c) Chief Justice of India
 - d) Parliament.
32. What is the tenure of office for the Election Commissioners?
 - a) 5 years or 65 years age whichever is early
 - b) 6 years or 60 years age whichever is early
 - c) 6 years or 65 years age whichever is early
 - d) 5 years or 60 years age whichever is early
33. Indian Constitution guarantees reservation of seats to scheduled castes (SC) and schedule tribes (ST) in
 - a) Lok Sabha and Legislative Assemblies
 - b) Lok Sabha only
 - c) Legislative Assemblies only
 - d) Rajya Sabha only
34. At present, the number of seats reserved in Government service for SC and ST people together is
 - a) 22.5% seats
 - b) 27% seats
 - c) 30.5% seats
 - d) 49.5% seats
35. The National commission for women was established under the
 - a) New Act, 1988
 - b) New Act, 1989
 - c) New Act, 1990
 - d) New Act, 1991
36. The Indian Federal system is modeled on the Federal system of
 - a) Canada
 - b) U.S.A
 - c) Australia
 - d) New Zealand

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Second Semester B.E. Degree Examination, Dec.2016/Jan.2017

Engineering Mathematics – II

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, choosing at least two from each part.**PART – A****1 a. Choose the correct answers for the following : (04 Marks)**

- i) The general solution of $p^2 - 7p + 12 = 0$ is,
 A) $(y + 3x - c)(y + 4x - c) = 0$ B) $(y - 3x - c)(y - 4x - c) = 0$
 C) $(y - 4x)(y + 3x) = 0$ D) None of these
- ii) If a differential equation is solvable for y then it is of the form,
 A) $x = f(y, p)$ B) $y = f(x, p)$ C) $y = f(x^2, py)$ D) $x = f(y^2, p)$
- iii) The singular solution of the equation $P = \log(px - y)$ is,
 A) $y = x(\log x - 1)$ B) $y = 1 - \log x$ C) $y = \log x - 2x$ D) $y = 1 - \log\left(\frac{1}{x}\right)$
- iv) Clairaut's equation of $P = \sin(y - xp)$ is,
 A) $y = \frac{P}{x} + \sin^{-1} p$ B) $y = px + \sin p$ C) $y = px + \sin^{-1} p$ D) $y = x + \sin^{-1} p$

b. Solve: $p(p + y) = x(x + y)$. (05 Marks)**c. Solve : $y = 2px + y^2 p^3$. (05 Marks)****d. Obtain the general solution and singular solution of the equation, $\sin px \cos y = \cos px \sin y + p$ (06 Marks)****2 a. Choose the correct answers for the following : (04 Marks)**

- i) Roots of $y'' - 6y' + 13y = 0$ are,
 A) $2 \pm 3i$ B) $2 \pm i$ C) $3 \pm i$ D) $3 \pm 2i$
- ii) The value of $\frac{1}{D}(f(x))$ is,
 A) $f'(x)$ B) $\frac{1}{f'(x)}$ C) $\int \frac{1}{f(x)} dx$ D) $\int f(x) dx$
- iii) The complementary function for the differential equation, $y'' + 2y' + y = \cosh x$ is,
 A) $(c_1 + c_2 x)e^{-x}$ B) $c_1 e^{-x} + c_2 e^x$ C) $(c_1 + c_2 x)e^x$ D) $(c_1 + c_2)e^{-x}$
- iv) The particular integral of $(D^2 - 2D + 4)y = e^x \cos x$ is,
 A) $e^x \sin x$ B) $\frac{e^x \cos x}{2}$ C) $\frac{e^x \sin x}{2}$ D) None of these

b. Solve $(4D^4 - 4D^3 - 23D^2 + 12D + 36)y = 0$ where $D = \frac{d}{dx}$. (05 Marks)**c. Solve : $(D^2 - 2D + 5)y = e^{2x} \sin x$. (05 Marks)****d. Solve : $\frac{dx}{dt} - 2y = \cos 2t$, $\frac{dy}{dt} + 2x = \sin 2t$ given that $x = 1$, $y = 0$ at $t = 0$. (06 Marks)****3 a. Choose the correct answers for the following : (04 Marks)**

- i) By the method of variation of parameters, the value of W is called,
 A) the Demorgan's function B) Euler's function
 C) Wronskian of the function D) None of these
- ii) In $x^2 y'' - xy' + y = x^2 \log x$ if $x = e^t$ then we get for $x^2 y''$ as,
 A) $(D - 1)y$ B) $D(D - 1)y$ C) $D(D + 1)y$ D) $D(D + 2)y$

- iii) To transform $(ax+b)^2 y'' + K_1(ax+b)y' + K_2y = \phi(x)$ into Legendre's linear equation we put $(ax+b) =$ _____
 A) e^{-t} B) $1+e^t$ C) $\frac{1}{e^{-t}}$ D) $1-e^t$
- iv) Frobenius series method of second order linear differential equation is of the form,
 A) $x^m \sum_{r=0}^{\infty} a_r x^r$ B) $\sum_{r=0}^{\infty} a_r x^r$ C) $\sum_{r=0}^{\infty} a_r x^{m-r}$ D) None of these
- b. Solve $(D^2 + 1)y = \operatorname{cosec} x \cot x$ by the method of variation of parameters. (05 Marks)
- c. Solve: $x^2 y'' + xy' + 9y = 3x^2 + \sin(3 \log x)$. (05 Marks)
- d. Obtain the series solution of the equation, $\frac{d^2 y}{dx^2} + xy = 0$. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) Form the partial differential equation by eliminating a and b from the relation $z = (x+a)(y+b)$ is,
 A) $z = pq$ B) $z = p+q$ C) $z = 1+p$ D) $z = 1+q$
- ii) The solution of $u_{xx} = x+y$ is $u =$ _____.
 A) $\frac{x^3}{6} + \frac{x^2 y}{2} + xf(y) + g(y)$ B) $\frac{x^3}{4} + \frac{x^2 y^2}{2} + yf(x) + g(y)$
 C) $\frac{xy}{3} + \frac{xy}{4} + yf(y) + g(x)$ D) None of these
- iii) The auxiliary equations of Lagrange's linear equation, $Pp + Qq = R$ are,
 A) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ B) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ C) $\frac{dx}{P} = \frac{-dy}{Q} = \frac{dz}{R}$ D) $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$
- iv) In the method of separation of variables to solve $u_x = 2u_t + u$, the trial solution is $u =$ _____.
 A) $X(x)Y(y)$ B) $X+Y$ C) $Z = X^2 + Y^2$ D) $X(x)T(t)$
- b. Solve $\frac{\partial^2 z}{\partial x^2} + z = 0$ given that when $x = 0$, $z = e^y$ and $\frac{\partial z}{\partial x} = 1$. (05 Marks)
- c. Solve : $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$. (05 Marks)
- d. Solve by the method of separation of variables $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$ where $u(x,0) = 6e^{-3x}$ (06 Marks)

PART - B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) The value of $\int_0^1 \int_0^6 xy dx dy$ is _____.
 A) 6 B) 7 C) 8 D) 9
- ii) The integral $\int_0^1 \int_0^{\sqrt{1-x^2}} (x+y) dy dx$ after changing the order of integration is _____.
 A) $\int_0^2 \int_0^{\sqrt{1-y^2}} (x+y) dx dy$ B) $\int_0^1 \int_0^{\sqrt{1-y^2}} (x+y) dx dy$ C) $\int_0^1 \int_0^{\sqrt{1+y^2}} (x+y) dx dy$ D) None of these
- iii) The value of $\int_0^{\infty} e^{-x^2} dx$ is _____.
 A) $\pi\sqrt{2}$ B) $2\sqrt{\pi}$ C) $\sqrt{2\pi}$ D) $\sqrt{\pi}/2$

iv) In terms of Beta function $\int_0^{\frac{\pi}{2}} \sin^7 \theta \sqrt{\cos \theta} d\theta = \underline{\hspace{2cm}}$

- A) $\beta\left(4, \frac{3}{4}\right)$ B) $\frac{1}{2}\beta\left(4, \frac{3}{4}\right)$ C) $\beta\left(2, \frac{3}{2}\right)$ D) $\frac{1}{2}\beta\left(2, \frac{3}{2}\right)$

b. Evaluate $\int_0^{\infty} \int_0^x x e^{\frac{-x^2}{y}} dy dx$ by changing the order of integration. (05 Marks)

c. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$. (05 Marks)

d. Express the integral $\int_0^1 x^m (1-x^n)^p dx$ in terms of beta functions and hence evaluate

$\int_0^1 x^5 (1-x^3)^{10} dx$. (06 Marks)

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

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

- A) Rotational B) Solenoidal C) Irrotational D) Dependent

ii) If $f = (5xy - 6x^2)i + (2y - 4x)j$ then $\int_C f \cdot dr$ where C is the curve $y = x^3$ from the points (1, 1) to (2, 8) is,

- A) 35 B) -35 C) $3x+4y$ D) None of these

iii) In Green's theorem in the plane $\iint_A \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx dy$ is _____

- A) $\iint_C (Mdx - Ndy)$ B) $\int_C (Mdx) \times (Ndy)$ C) $\int_C (Ndx - Mdy)$ D) $\int_C (Mdx + Ndy)$

iv) If C be a simple closed curve in space and S be the open surface, f be the vector field then $\int_C f \cdot dv = \underline{\hspace{2cm}}$

- A) $\int_S (\text{curl } f) \cdot nds$ B) $\int_C (\nabla \times f) \cdot ds$ C) $\int_S (\nabla^2 f) \cdot nds$ D) $\int_C (\nabla \cdot f) \cdot nds$

b. If $f = (3x^2 + 6y)i - 14yzj + 20xz^2k$ evaluate $\int_C f \cdot dr$ from (0, 0, 0) to (1, 1, 1) along the curve C given by $x = t, y = t^2, z = t^3$. (05 Marks)

c. Verify Green's theorem for $\int_C (xy + y^2)dx + x^2dy$ where C is the closed curve made up of the line $y = x$ and the parabola $y = x^2$. (05 Marks)

d. If $\vec{F} = 2xyi + yz^2j + xzk$ and S is the rectangular parallelopiped bounded by $x = 0, y = 0, z = 0, x = 2, y = 1, z = 3$ evaluate $\iint_S \vec{F} \cdot \hat{n} ds$. (06 Marks)

7 a. Choose the correct answers for the following :

i) $L\{\sinh at\} = \underline{\hspace{2cm}}$

A) $\frac{a}{s^2 + a^2}$

B) $\frac{s}{s^2 - a^2}$

C) $\frac{a}{s^2 - a^2}$

D) $\frac{s}{s^2 + a^2}$

ii) $L\{t^2 e^{-at}\} = \underline{\hspace{2cm}}$

A) $\frac{1}{(s+a)^3}$

B) $\frac{2}{(s+a)^2}$

C) $\frac{3}{(s+a)^3}$

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iii) Transform of unit function $L\{u(t-a)\} = \underline{\hspace{2cm}}$

A) $\frac{e^{as}}{s}$

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C) $\frac{e^{-as}}{s}$

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iv) $L[\delta(t-a)]$ is equal to,

A) 0

B) -1

C) e^{-as}

D) e^{as}

b. Find $L\left[\frac{1-\cos 3t}{t}\right]$.

(05 Marks)

c. Find $L\{f(t)\}$ where $f(t) = \begin{cases} 3t, & 0 < t < 2 \\ 6, & 2 < t < 4 \end{cases}$ where the period is 4.

(05 Marks)

d. Express $f(t)$ in terms of unit step function and hence find $L\{f(t)\}$ given that $f(t) = \begin{cases} t^2, & 0 < t \leq 2 \\ 4t, & t > 2 \end{cases}$.

(06 Marks)

8 a. Choose the correct answers for the following :

(04 Marks)

i) $L^{-1}\left\{\frac{s}{s^2-16}\right\} = \underline{\hspace{2cm}}$

A) $\cosh 4t$

B) $\sinh 4t$

C) $\frac{1}{4}\cos 4t$

D) None of these

ii) $L^{-1}\left\{\frac{s+1}{s^2+6s+9}\right\} = \underline{\hspace{2cm}}$

A) $e^{3t}(1+2t)$

B) $e^{-3t}(1-2t)$

C) $e^{-3t}(1+2t)$

D) $e^{-3t}(1+t)$

iii) $L^{-1}\left\{\cot^{-1}\left(\frac{s}{a}\right)\right\} = \underline{\hspace{2cm}}$

A) $\frac{\sin t}{t}$

B) $\frac{\sinh at}{t}$

C) $\frac{\sin at}{t}$

D) $\frac{\sinh t}{t}$

iv) $L^{-1}[\bar{f}(s) \cdot \bar{g}(s)] = \underline{\hspace{2cm}}$

A) $f(t) \cdot g(t)$

B) $\int_0^t f(u)g(t-u)du$

C) $\int_0^t f(u)g(u)du$

D) None of these

b. Find $L^{-1}\left[\frac{4s+5}{(s+1)^2(s+2)}\right]$.

(05 Marks)

c. Find $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$ using convolution theorem.

(05 Marks)

d. Solve $y''(t) + 4y'(t) + 4y(t) = e^{-t}$ with $y(0) = 0$ and $y'(0) = 0$ using Laplace transform method.

(06 Marks)

Second Semester B.E. Degree Examination, Dec.2016/Jan.2017

Engineering Mathematics – II

Time: 3 hrs.

Max. Marks:100

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

PART – A

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

- i) The general solution of $p^2 - 7p + 12 = 0$ is,
 A) $(y + 3x - c)(y + 4x - c) = 0$ B) $(y - 3x - c)(y - 4x - c) = 0$
 C) $(y - 4x)(y + 3x) = 0$ D) None of these
- ii) If a differential equation is solvable for y then it is of the form,
 A) $x = f(y, p)$ B) $y = f(x, p)$ C) $y = f(x^2, py)$ D) $x = f(y^2, p)$
- iii) The singular solution of the equation $P = \log(px - y)$ is,
 A) $y = x(\log x - 1)$ B) $y = 1 - \log x$ C) $y = \log x - 2x$ D) $y = 1 - \log\left(\frac{1}{x}\right)$
- iv) Clairaut's equation of $P = \sin(y - xp)$ is,
 A) $y = \frac{P}{x} + \sin^{-1} p$ B) $y = px + \sin p$ C) $y = px + \sin^{-1} p$ D) $y = x + \sin^{-1} p$

b. Solve: $p(p + y) = x(x + y)$. (05 Marks)c. Solve : $y = 2px + y^2 p^3$. (05 Marks)d. Obtain the general solution and singular solution of the equation,
 $\sin px \cos y = \cos px \sin y + p$ (06 Marks)

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

- i) Roots of $y'' - 6y' + 13y = 0$ are,
 A) $2 \pm 3i$ B) $2 \pm i$ C) $3 \pm i$ D) $3 \pm 2i$
- ii) The value of $\frac{1}{D}(f(x))$ is,
 A) $f'(x)$ B) $\frac{1}{f'(x)}$ C) $\int \frac{1}{f(x)} dx$ D) $\int f(x) dx$
- iii) The complementary function for the differential equation, $y'' + 2y' + y = \cosh x$ is,
 A) $(c_1 + c_2 x)e^{-x}$ B) $c_1 e^{-x} + c_2 e^x$ C) $(c_1 + c_2 x)e^x$ D) $(c_1 + c_2)e^{-x}$
- iv) The particular integral of $(D^2 - 2D + 4)y = e^x \cos x$ is,
 A) $e^x \sin x$ B) $\frac{e^x \cos x}{2}$ C) $\frac{e^x \sin x}{2}$ D) None of these

b. Solve $(4D^4 - 4D^3 - 23D^2 + 12D + 36)y = 0$ where $D = \frac{d}{dx}$. (05 Marks)c. Solve : $(D^2 - 2D + 5)y = e^{2x} \sin x$. (05 Marks)d. Solve : $\frac{dx}{dt} - 2y = \cos 2t$, $\frac{dy}{dt} + 2x = \sin 2t$ given that $x = 1$, $y = 0$ at $t = 0$. (06 Marks)

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

- i) By the method of variation of parameters, the value of W is called,
 A) the Demorgan's function B) Euler's function
 C) Wronskian of the function D) None of these
- ii) In $x^2 y'' - xy' + y = x^2 \log x$ if $x = e^t$ then we get for $x^2 y''$ as,
 A) $(D-1)y$ B) $D(D-1)y$ C) $D(D+1)y$ D) $D(D+2)y$

- iii) To transform $(ax+b)^2 y'' + K_1(ax+b)y' + K_2y = \phi(x)$ into Legendre's linear equation we put $(ax+b) =$ _____
 A) e^{-t} B) $1+e^t$ C) $\frac{1}{e^{-t}}$ D) $1-e^t$
- iv) Frobenius series method of second order linear differential equation is of the form,
 A) $x^m \sum_{r=0}^{\infty} a_r x^r$ B) $\sum_{r=0}^{\infty} a_r x^r$ C) $\sum_{r=0}^{\infty} a_r x^{m-r}$ D) None of these
- b. Solve $(D^2 + 1)y = \operatorname{cosec} x \cot x$ by the method of variation of parameters. (05 Marks)
- c. Solve: $x^2 y'' + xy' + 9y = 3x^2 + \sin(3 \log x)$. (05 Marks)
- d. Obtain the series solution of the equation, $\frac{d^2 y}{dx^2} + xy = 0$. (06 Marks)
- 4 a. Choose the correct answers for the following : (04 Marks)
- i) Form the partial differential equation by eliminating a and b from the relation $z = (x+a)(y+b)$ is,
 A) $z = pq$ B) $z = p + q$ C) $z = 1 + p$ D) $z = 1 + q$
- ii) The solution of $u_{xx} = x + y$ is $u =$ _____.
 A) $\frac{x^3}{6} + \frac{x^2 y}{2} + xf(y) + g(y)$ B) $\frac{x^3}{4} + \frac{x^2 y^2}{2} + yf(x) + g(y)$
 C) $\frac{xy}{3} + \frac{xy}{4} + yf(y) + g(x)$ D) None of these
- iii) The auxiliary equations of Lagrange's linear equation, $Pp + Qq = R$ are,
 A) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ B) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ C) $\frac{dx}{P} = \frac{-dy}{Q} = \frac{dz}{R}$ D) $\frac{dx}{x} = \frac{dy}{y} = \frac{dz}{z}$
- iv) In the method of separation of variables to solve $u_x = 2u_t + u$, the trial solution is $u =$ _____.
 A) $X(x)Y(y)$ B) $X + Y$ C) $Z = X^2 + Y^2$ D) $X(x)T(t)$
- b. Solve $\frac{\partial^2 z}{\partial x^2} + z = 0$ given that when $x = 0$, $z = e^y$ and $\frac{\partial z}{\partial x} = 1$. (05 Marks)
- c. Solve : $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$. (05 Marks)
- d. Solve by the method of separation of variables $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$ where $u(x, 0) = 6e^{-3x}$ (06 Marks)

PART - B

- 5 a. Choose the correct answers for the following : (04 Marks)
- i) The value of $\int_0^1 \int_0^6 xy dx dy$ is _____.
 A) 6 B) 7 C) 8 D) 9
- ii) The integral $\int_0^1 \int_0^{\sqrt{1-x^2}} (x+y) dy dx$ after changing the order of integration is _____,
 A) $\int_0^2 \int_0^{\sqrt{1-y^2}} (x+y) dx dy$ B) $\int_0^1 \int_0^{\sqrt{1-y^2}} (x+y) dx dy$ C) $\int_0^1 \int_0^{\sqrt{1+y^2}} (x+y) dx dy$ D) None of these
- iii) The value of $\int_0^{\infty} e^{-x^2} dx$ is _____.
 A) $\pi\sqrt{2}$ B) $2\sqrt{\pi}$ C) $\sqrt{2\pi}$ D) $\sqrt{\pi}/2$

- iv) In terms of Beta function $\int_0^{\frac{\pi}{2}} \sin^7 \theta \sqrt{\cos \theta} d\theta =$ _____
- A) $\beta\left(4, \frac{3}{4}\right)$ B) $\frac{1}{2}\beta\left(4, \frac{3}{4}\right)$ C) $\beta\left(2, \frac{3}{2}\right)$ D) $\frac{1}{2}\beta\left(2, \frac{3}{2}\right)$
- b. Evaluate $\int_0^{\infty} \int_0^x x e^{\frac{-x^2}{y}} dy dx$ by changing the order of integration. (05 Marks)
- c. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dz dy dx$. (05 Marks)
- d. Express the integral $\int_0^1 x^m (1-x^n)^p dx$ in terms of beta functions and hence evaluate $\int_0^1 x^5 (1-x^3)^{10} dx$. (06 Marks)
- 6 a. Choose the correct answers for the following : (04 Marks)
- i) If $\int_C \vec{F} \cdot d\vec{r} = 0$ then $\vec{F}$ is called,
- A) Rotational B) Solenoidal C) Irrotational D) Dependent
- ii) If $f = (5xy - 6x^2)i + (2y - 4x)j$ then $\int_C f \cdot dr$ where C is the curve $y = x^3$ from the points (1, 1) to (2, 8) is,
- A) 35 B) -35 C) $3x+4y$ D) None of these
- iii) In Green's theorem in the plane $\iint_A \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y} \right) dx dy$ is _____
- A) $\iint_C (Mdx - Ndy)$ B) $\int_C (Mdx) \times (Ndy)$ C) $\int_C (Ndx - Mdy)$ D) $\int_C (Mdx + Ndy)$
- iv) If C be a simple closed curve in space and S be the open surface, f be the vector field then $\int_C f \cdot dv =$ _____
- A) $\int_S (\text{curl } f) \cdot nds$ B) $\int_C (\nabla \times f) \cdot ds$ C) $\int_S (\nabla^2 f) \cdot nds$ D) $\int_C (\nabla \cdot f) \cdot nds$
- b. If $f = (3x^2 + 6y)i - 14yzj + 20xz^2k$ evaluate $\int_C f \cdot dr$ from (0, 0, 0) to (1, 1, 1) along the curve C given by $x = t, y = t^2, z = t^3$. (05 Marks)
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