

Seat Number

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Engineering Chemistry - II (New) Also Old Equivalence (102112)

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub-question from each unit.
5. Assume suitable data wherever necessary.
6. Use of logarithmic table, drawing instrument and non-programmable calculator is permitted.
7. Figure to the right indicate full marks.

UNIT - I

1. a) How are the calorific values of gaseous and volatile liquid fuels determined? Give neat labelled diagram of the calorimeter used. 8

- b) i) Give preparation, properties and uses of Bio-diesel. 4

- ii) The coal sample gave the following data in the calorific value. 4

Weight of Coal sample	= 0.9 gms
Water equivalent of Calorimeter	= 440 gms
Weight of water	= 2560 gms
Rise in temperature	= 2.42°C
Cooling Correction	= 0.052°C
Fuse Wire Correction	= 10.0 cal

Calculate the gross calorific value and Net calorific value if the coal contains 6% hydrogen and assume latent heat of steam equal to 600 callgms.

- c) i) Explain the different steps involved in proximate analysis of coal. (any two) 4
- ii) Explain the fractional distillation of crude petroleum with well labelled diagram. 4

UNIT - II

2. a) Explain the construction and working of Pensky - Marten's apparatus used for determination of Flash and Fire points of an oil. 8
- b) i) Explain thin film lubrication with suitable diagram. 4
- ii) What is cloud point and pour point of an oil? How are they determined? 4
- c) i) Which types of lubricants you will suggest for the following systems and why? 4
Gears and Internal combustion engine. 4
- ii) What is Neutralisation number of an oil? Give the method for determination of Neutralisation number. 4

UNIT - III

3. a) What are refractories? Describe the characteristics of a good refractory. Explain also the difference between acidic and basic refractories. 8
- b) i) Describe the preparation properties and uses of Graphite refractories. 4
- ii) Give the preparation, properties and uses of Fire-clay refractories. 4
- c) i) Explain refractoriness & Thermal conductivity. 4
- ii) Give preparation, properties and uses of dolomite refractories. 4

UNIT - IV

4. a) Describe the mechanism of hydrogen evolution and oxygen absorption in electrochemical corrosion. 8
- b) i) Give the differences between Galvanising and Tinning. 4
- ii) Discuss protective surface coating of metals. 4

- c) i) Explain in detail caustic embrittlement in stress corrosion. 4
- ii) Discuss the cathodic protection, methods for controlling corrosion. 4

UNIT - V

5. a) How can you classify the water pollutants? What are the effect of it on human beings? 8
- b) i) Write a note on ozone layer depletion. 4
- ii) Give causes, effect and control measures of Noise Pollution. 4
- c) i) Explain the term BOD and it's determination process. 4
- ii) Write a note on Green - house effect. 4

Seat Number

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चकवा - 004

**Engineering Drawing & Elements of
Mechanical Engineering
(New) (102115)**

P. Pages : 4

Time : Three Hours

Max. Marks : 80

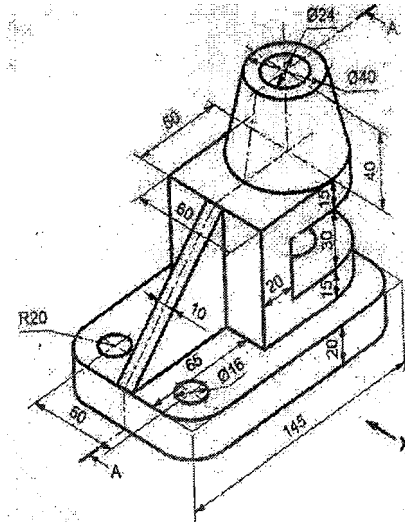
Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub questions in question No. 1, 4 and 5 and solve **any one** sub questions in question NO. 2 and 3.
5. Use both sides of drawing sheet.
6. Assume suitable data wherever necessary.
7. Use of drawing instruments and non programmable calculator is allowed.
8. Figure to the right indicate full marks.
9. Solve question no. 1, 2 and 3 on drawing sheet and solve question no. 4 & 5 on separate theory answer sheet.

1. a) End A of line AB is 20 mm above HP and 40mm in front of VP. Line is inclined at 30° to HP. Top view of line measures 60mm. Draw its three views. Find true length of line and describe the position of end B line. **8**
- b) A regular pentagonal plate of side 30mm is resting on its side in HP. The plate is inclined at 30° to HP. Draw its three views. **8**
- c) An isosceles triangular plate with 50mm base and 75 mm altitude is resting on its base in HP. The plate is inclined to HP such that it appears as equilateral triangle in side view. Draw its three views and find the inclination of plate with HP. **8**

2. Figure shows isometric view of an object using first angle method, Draw its 16

- Sectional F.V. along AA in X direction.
- Top view
- LHSV.

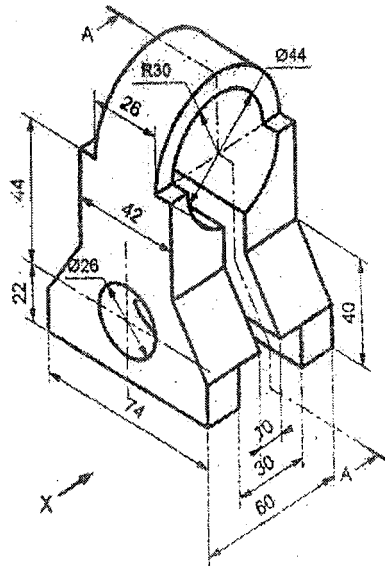


OR

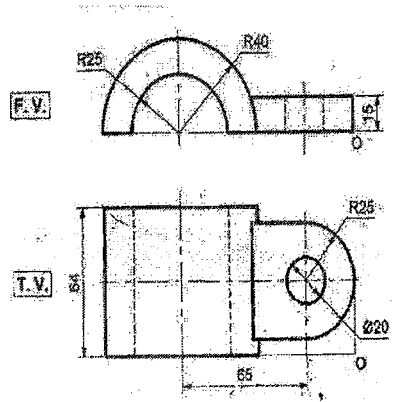
Figure shows isometric view of an object, Draw its.

16

- Sectional F. V. along AA in x direction.
- Top view.
- RHSV. Use first angle method.

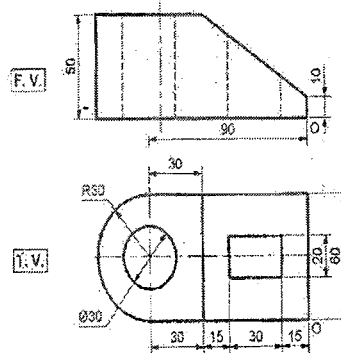


3. Figure shows F. V. and T.V. with 'O' as origin draw its isometric view. 16



OR

- Figure shows F. V. and T. V. with 'O' as origin draw its isometric projection. 16



4. a) With neat sketch explain thermal power plant. 8
- b) i) Differentiate 2 –stroke and 4 stroke engine. 4
- ii) Write short note on energy audit. 4
- c) i) Explain various forms of energy 4
- ii) Explain sign convention of heat and work. 4

5. a) With neat sketch explain reciprocating air compressor. 8
- b) i) Differentiate axle and shaft. 4
- ii) What are the advantages of chain drive. 4
- c) i) With neat sketch explain non return valve. 4
- ii) Explain various types of keys. 4

Seat Number

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चक्रवा - 005

Introduction to Computing (Old) (1130)

P. Pages : 2

Time : Two Hours

Max. Marks : 50

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt any one questions from each unit.
5. Draw suitable diagrams wherever necessary.
6. Figures to the right indicate full marks.
7. Assume suitable data wherever necessary.

UNIT - 1

1. a) What is memory? Discuss various types of memory in detail? 10
b) i) Explain advantages and limitations of magnetic disk. 5
ii) Discuss various applications of computer in engineering. 5

UNIT - 2

2. a) What is operating system? Discuss various types & functions of operating system. 10
b) i) What are types of printer? Explain any one in brief? 5
ii) What is Scanner? Write operations of scanning process? 5

UNIT - 3

3. a) Explain windows operating system with advantages and disadvantages. 10
b) i) Discuss Internet applications in brief 5

- ii) Write steps for dial-up connections to get connected to Internet. 5

UNIT - 4

4. a) i) Explain advantages and limitations of high level languages. 5
 ii) Write a note on features of good programming languages. 5
 b) i) State and explain various characteristics of good program. 5
 ii) Classify programming languages with respect to their properties, advantages & disadvantages. 5

UNIT - 5

5. a) i) Write a program in 'C' language to print multiplication table of 4 with n terms. 5
 ii) Write a program in 'C' language to calculate factorial of given number. 5
 b) i) Explain function in detail with example. 5
 ii) Discuss various loop statements. 5

Seat Number

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चकवा - 006

Engineering Physics - 11 (New)
Also Old Equivalence (102111)

P. Pages : 3

Time : Three Hours

Max. Marks 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub questions from each unit.
5. Assume suitable data wherever necessary.
6. Use of non-programmable calculator is permitted.

UNIT - I

1. a) What are ultrasonic waves? Describe the principle, construction and working of magnetostriction transducer for production of ultrasonic waves. **8**
- b) i) List the factors affecting the architectural acoustic. Explain effect of Echo & reverberation time on acoustic with remedy. **4**
ii) A classroom has a volume $4 \times 6 \times 8 \text{ m}^3$ and has reverberation time of 1 sec. Find-;
i) Total absorption in the classroom. **4**
ii) If 30 students are in the classroom and reach equivalent to 0.5 owu. Find the new reverberation time of classroom.
- c) i) Define: **4**
i) Coefficient of absorption. ii) Standard reverberation time.
iii) loudness. iv) Piezoelectric effect.
- ii) Calculate the thickness of a quartz plate needed to produce ultrasonic waves of frequencies. **4**
i) 2 MHz ii) 30KHz

चकवा - 006

P.T.O

UNIT - II

2. a) Draw hysteresis curve and explain it ? Distinguish between soft and Hard Magnetic material. 8
- b) i) What is Superconductivity. Give its properties. 4
- ii) An iron ring of mean circumferential length 30 cm and cross section 1 cm^2 is wound uniformly with 300 turns of wire. When a current of 0.032 amp. Flows in the windings, the flux in the ring is $2 \times 10^{-6} \text{ wb}$. 4
- Find
- i) Flux density in the ring. ii) Magnetic Intensity.
- iii) Permeability iv) Relative permeability of iron.
- (Given $\mu_0 = 4\pi \times 10^{-7} \text{ Wblamp-meter}$)
- c) i) What are ferrites. State their properties. 4
- ii) A Magnetising field of 1000 Alm produces a magnetic flux of $2 \times 10^{-5} \text{ Wb}$. in a bar of iron of 0.2 cm^2 cross section. Calculate the Permeability and susceptibility of the bar. 4

UNIT - III

3. a) Define normal and anomalous zeeman effect. Explain the normal zeeman effect with experimental arrangement. 8
- b) i) Draw the block diagram of CRO. State its applications. 4
- ii) An electron is accelerated through a potential difference of 5KV and enter in a uniform magnetic field of 0.02 Wblm^2 acting normal to the direction of electron motion. Determine the radius of the path. 4
- c) i) Write a note on NMR. 4
- ii) A mixture of Neon isotopes Ne^{20} & Ne^{21} is analysed by using bainbridge mass spectrograph. Calculate the linear separation of isotopes when the electric field acting on velocity selector is 80 Kvlm and Magnetic flux density is 0.55 Wblm^2 . 4

UNIT - IV

4. a) Define wave function? Obtain an expression for the energy levels of a particle enclosed within infinite potential well. 8
- b) i) What are Matter wave? State the dissimilarities between Matter wave and electromagnetic wave. 4
- ii) Calculate the De-Broglie wavelength of a 2eV photon and an electron with Kinetic energy of 2eV. 4
- c) i) Explain the experiment for location of a particle by microscope to illustrate Heisenberg's uncertainty principle. 4
- ii) A bullet of mass 25 grams is moving with a speed of 400m/s. The speed is measured accurate upto 0.02%. Calculate the certainty with which the position of the bullet can be located. 4

UNIT - V

5. a) Explain how the nano materials are synthesis by using chemical Method. (synthesis of colloids). 8
- b) Explain the synthesis of nano material by vapour deposition method and mechanical method. 8
- c) i) Give advantages and limitations of nano material. 4
- ii) Write short on top-down appro-ach. 4

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चकवा - 007

Engineering Mathematics - II
(New) (102113) Also old Equivalence

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Figures to the right indicate full marks.
5. All questions are compulsory.
6. Use of non-programmable electronic calculator is allowed.

1. Attempt any two :

- a) i) if $y = f(x + at) + g(x - at)$, then find value of $\frac{\partial^2 y}{\partial t^2} - a^2 \frac{\partial^2 y}{\partial x^2}$ 4
- ii) if $u = x^2 yz - 4y^1 z^2 + 2xz^3$, then prove that $x u_x + y u_y + z u_z = 4u$. 4
- b) i) if $u = \sqrt{x^2 + y^2}$ and $x^3 + y^3 + 3axy = 5a^2$, then find $\frac{du}{dx}$. 4
- ii) if $y \log \sin x = x \log \cos x$, then find $\frac{dy}{dx}$. 4
- c) If $u = f(x^2 - y^2, y^2 - z^2, z^2 - x^2)$ then find $\frac{1}{x} \frac{du}{dx} + \frac{1}{y} \frac{du}{dy} + \frac{1}{z} \frac{du}{dz}$ 8

2. Attempt **any two**.

a) i) if $u = xy$ and $v = \frac{x+y}{x-y}$ then find $\frac{\partial(x,y)}{\partial(u,v)}$. 4

ii) Examine for functional dependence $u = \frac{x-y}{1+xy}$ and $v = \tan^{-1} x - \tan^{-1} y$, if functionally dependent then find relation between u and v . 4

b) i) The period T of simple pendulum is $T = 2\pi\sqrt{\frac{l}{g}}$, Find the percentage error in T due to possible error 1% in l and 2.5% in g . 4

ii) Find $[(0.98)^2 + (2.01)^2 + (1.94)^2]^{1/2}$, using approximation. 4

c) Decompose a positive number 'a' into three parts, so that their product is maximum. 8

3. Attempt **any two**.

a) i) Trace the curve $r = a(1 + \cos\theta)$, with justification. 4

ii) Find the Fourier series expansion for $f(x) = x$ in $-\pi < x < \pi$. 4

b) i) Trace the curve $x(x^2 + y^2) = a(x^2 - y^2)$ with justification. 4

ii) Find the half range cosine series for $f(x) = lx - x^2$ in the interval $0 < x < l$. 4

c) Find the Fourier series expansion for $f(x) = x^2$ in $(0, 4)$ and hence 8

deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \dots = -\left[\frac{\pi^2}{3}\right]$.

4. Attempt **any two**.

a) i) Evaluate $\iint y \, dx \, dy$, over the region enclosed by parabola $y = x^2$ and the line $y = x + 2$. 4

ii) Change the order of integration

4

$$\int_0^1 \int_x^{\sqrt{x}} f(x,y) dx dy.$$

b) Evaluate $\int_0^\infty \int_0^\infty \int_0^\infty \frac{dx dy dz}{(1+x^2+y^2+z^2)^2}.$

8

c) i) Find the total area between two cardioids $r = a(1+\cos\theta)$ and $r = a(1-\cos\theta)$.

4

ii) Find the volume common to the cylinder's $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$.

4

5. Attempt **any two**

a) i) Using Taylor's series method find $y(0.1)$ correct to four decimal places given that $\frac{dy}{dx} = x^2y - 1, y(0) = 1$.

4

ii) Using Picard's method find $y(0.2)$ upto second approximation given that $\frac{dy}{dx} = \left[\frac{3}{\sqrt{x}} + y - 1 \right], y(0) = 1$.

4

b) Determine using modified Euler's method the value of y when $x = 0.1$ given that $\frac{dy}{dx} = x^2 + y$ for $y(0) = 1$ and $h = 0.05$.

8

c) Using Fourth order Runge Kutta method, find $y(0.2)$ given that $\frac{dy}{dx} = \sqrt{x+y}, y(0) = 1$ and $h = 0.1$.

8

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Elements of Electrical Engineering (Old)(1120)

P. Pages : 3

Time : Two Hours

Max. Marks : 50

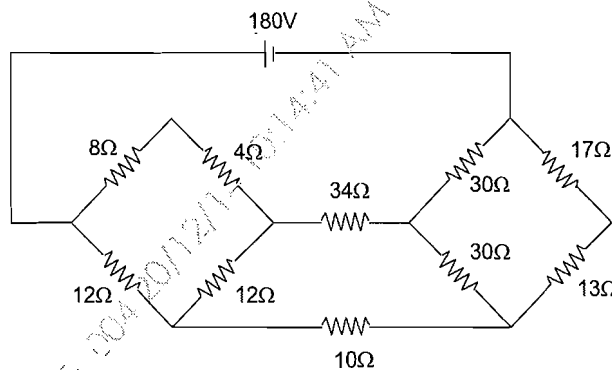
Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Figure to the right indicates full marks.
5. Use of non-programmable calculator is allowed.
6. Assume suitable data if necessary.
7. Answer **any two** from each question (unit)

UNIT - I

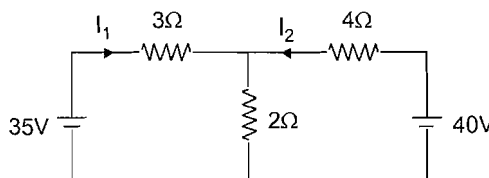
1. a) Calculate the current through 10Ω resistor in following fig.

5



- b) Calculate the current through 2Ω resistor in following fig.

5



- c) Define : 5
- i) Resistance ii) Resistivity
- iii) Conductance iv) Conductivity

UNIT - II

2. a) An iron ring has a mean diameter of 15cm, a cross-section of 20cm^2 & radial gap of 0.5 mm cut in it. It is uniformly wound with 1500 turns of insulated wire and magnetising current of 1 A produces a flux of 1 m wb. Neglecting the effect of magnetic leakage & fringing. Calculate: 5
- i) Reluctance of magnetic circuit.
- ii) Relative permeability.
- b) Give the comparison between magnetic and electric circuit. 5
- c) Define the following. 5
- i) Magnetomotive force.
- ii) Reluctance
- iii) Permeance.

UNIT - III

3. a) The following expression represent the instantaneous value of e.m.f. in three coils connected in series 5
- $e_1 = 50 \sin \omega t$
- $e_2 = 40 \sin(\omega t + 60^\circ)$
- $e_3 = 60 \sin(\omega t - 30^\circ)$
- Find an expression for the resultant emf, when the coils are connected to give the sum of three emf.
- b) Discuss the generation process of alternating voltage and current. 5
- c) Define the following ac terminology. 5
- i) Waveform ii) Instantaneous value
- iii) Cycle iv) Time period
- v) Frequency

UNIT – IV

4. a) Two impedances $z_1 = 8 + j6$ & $z_2 = 3 - j4$ are connected in parallel across 230V, 50Hz supply. Calculate : 5
- Current in each branch
 - Line current
 - Circuit power factor.
 - Power supply taken by the circuit.
- b) Three impedances $z_1 = 4 + j3$, $z_2 = 8 + j6$ & $z_3 = 7 - j9\Omega$ are connected in series across 100V, 50Hz supply. Calculate: 5
- Total impedance of the circuit.
 - The circuit current
 - Admittance of each impedance.
 - Power consumed by circuit.
- c) Define : 5
- Impedance.
 - Susceptance.
 - Admittance.

UNIT – V

5. Write short notes on : 5
- Fuses 5
 - Earthing. 5
 - Safety, precautions. 5

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Seat Number

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चकवा - 009

Elements of Civil Engineering (Old) (1110)

P. Pages : 2

Time : Two Hours

Max. Marks : 50

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Use of non-programmable calculator is allowed.
6. Draw neat sketches whenever necessary & assume suitable data if required.

UNIT - I

1.
 - a) Explain about Environmental engineering. 5
 - b) Explain the principles of surveying. 5
 - c) Describe the term hourbours. 5

UNIT - II

2.
 - a) Differentiate between whole circle bearing system and reduced bearing system. 5
 - b) Explain about indirect or Reciprocal Ranging. 5
 - c) A line was measured with a steel tape which was exactly 30 m. length at a temperature of 20° c and a pull of 10 Kg. The measured length was 1650 m. The temperature during measurement was 30° c and pull applied was 15 Kg. Find the true length of the line if the cross - sectional area of the tape was 0.025 sq. cm. The coefficient of expansion of the material of the tape per degree Celsius is 3.5×10^{-6} and modulus of elasticity of the material of tape is 2.1×10^6 Kg/cm². 5

UNIT - III

3. a) Explain the terms 5
- i) Bench mark. ii) Reduced level.
- iii) Back sight reading. iv) Fore sight reading.
- v) Change point.
- b) What is mean by contour and contour interval. List out the various factors affecting the contour interval. 5
- c) The following readings were taken with a level and 4.0 m staff on a continuously sloping ground at a common interval of 30 m. The readings are 0.780, 1.535, 1.955, 2.430, 2.985, 3.480, 1.155, 1.960, 2.365, 3.640, 0.935, 1.045, 1.630, 2.545. The RL of the first point A was 180.750 m. Rule out a page of level field book and enter the above readings. Calculate the reduced levels of the points by the collimation system. Also calculate the gradient of the line joining the 1st & last point. 5

UNIT - IV

4. a) Compare load bearing structure with framed structure. 5
- b) What is horizontal circulation and vertical circulation and ways to achieve them. 5
- c) State the functions of foundations. 5

UNIT - V

5. a) State the qualities of a good building stone. 5
- b) State properties and uses of timber. 5
- c) State properties and uses of glass. 5

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Engineering Mathematics - I (New)
Also Old Equivalence
(101103)

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub questions from each unit.
5. Figures to the right indicate full marks.
6. Use of non programmable calculator is allowed.

UNIT - I

1. a) Investigate for what values of λ and μ the system 8

$$3x + 2y + z = 6$$

$$3x + 4y + 3z = 14$$

$$6x + 10y + \lambda z = \mu$$

- have i) No solution ii) an unique solution
 iii) an infinite no. of solutions.

- b) Find eigen values and eigen vectors of 8

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 1 & 2 & 1 \\ -2 & 1 & -1 \end{bmatrix}$$

- c) 4

- i) If $A = \begin{bmatrix} \frac{1}{3} & \frac{2}{3} & a \\ \frac{2}{3} & \frac{1}{3} & b \\ \frac{2}{3} & -\frac{2}{3} & c \end{bmatrix}$ is orthogonal. Find a, b, c.

- ii) If the centre of the arc of the circle is (20, 30, 40). If origin is (0, 0, 0), rotation is about y - axis by an angle 30° . Find new co-ordinates of the centre of the arc of the circle. 4

UNIT - II

2. a) If $y = (\sin^{-1} x)^2$, find $(y_n)_0$ 8

b) Show that, 8

$$\sin(m \sin^{-1} x) = mx - \frac{m(m^2 - 1)}{3!} x^3 + \frac{m(m^2 - 1)(m^2 - 3^2)}{5!} x^5 + \dots$$

- c) i) Expand $\sin x$ in powers of $\left(x - \frac{\pi}{2}\right)$ 4

- ii) Using Taylor's theorem, find approximate value of $\sin(30^\circ 30')$ 4

UNIT - III

3. a) Prove that $\int_0^\infty \frac{1}{(e^x + e^{-x})^n} dx = \frac{1}{4} \beta\left(\frac{n}{2}, \frac{n}{2}\right)$ 8

Hence evaluate $\int_0^\infty \text{sech}^8 x dx$

- b) i) Evaluate $\int_0^\infty \sqrt{y} e^{-y^3} dy$ 4

- ii) Show that $\int_0^\infty e^{-x^2 - 2bx} dx = \frac{\sqrt{\pi}}{2} e^{-b^2} \text{erfc}(b)$ 4

- c) i) Show that $\int_0^1 \frac{x^a - x^b}{\log x} dx = \log\left(\frac{a+1}{b+1}\right)$ 4

- ii) Define $\text{erfc}(ax)$. find $\frac{d}{dx} \text{erfc}(ax)$. 4

UNIT - IV

4. a) i) Solve : $\frac{dy}{dx} = \frac{\sin y + y \sin x}{\cos x - x \cos y}$ 4
- ii) Solve : $(y + xy^2)dx - xdy = 0$ 4
- b) i) Solve : $xe^x = (x^3 + 2ye^x)\frac{dx}{dy}$ 4
- ii) Solve : $(x^2y^3 + xy)\frac{dy}{dx} = 1$ 4
- c) In a circuit containing inductance L, resistance R and voltage E, the current I is given by $E = RI + L\frac{dI}{dt}$ 8
 Given L = 600 h, R = 200Ω, E = 500V
 initially there is no current in circuit, find the time that elapses, before it reaches 75% of its maximum value.

UNIT - V

5. a) i) If $\tan(x+iy)=i$; where x and y are real. 4
 Prove that x is indeterminate and y is infinite.
- ii) If $\cos^{-1}(x+iy)=\alpha+i\beta$, prove that 4
 i) $x^2 \sec^2 \alpha - y^2 \operatorname{cosec}^2 \alpha = 1$
 ii) $x^2 \operatorname{sech}^2 \beta + y^2 \operatorname{cosech}^2 \beta = 1$
- b) i) Show that $\sin \left[i \log \left(\frac{a-ib}{a+ib} \right) \right] = \frac{2ab}{a^2+b^2}$ 4
- ii) Prove that, $\frac{(1+i)^{(1-i)}}{(1-i)^{(1+i)}} = \sin(\log 2) + i \cos(\log 2)$ 4
- c) i) Separate into real and imaginary parts of $(\sqrt{i})^i$ 4
- ii) Prove that, $\operatorname{sech}^{-1}(\sin \theta) = \log \cot \frac{\theta}{2}$ 4

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Engineering Chemistry - I (New)
Also Old Equivalence
(101102)

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Use of non - programmable calculator are allowed.
5. Attempt **any two** sub question from each unit.
6. Figures to the right indicate full marks.

UNIT - I

1. a) The water sample has the analytical report as under : 8
 $\text{MgCO}_3 - 84\text{mg/l}$
 $\text{CaCO}_3 - 40\text{mg/l}$
 $\text{CaCl}_2 - 55.5\text{mg/l}$
 $\text{Mg}(\text{NO}_3)_2 - 37\text{mg/l}$
 $\text{KCl} - 20\text{mg/l}$
 Calculate the amount of lime (86%) pure and soda (83%) pure needed for the treatment of 80,000 litres of water.
- b) Explain Zeolite process for water softening including Advantages and Disadvantages.* 8
- c) i) Explain boiler corrosion (any one) 4
 ii) Distinguish between priming and foaming. 4

UNIT - II

2. a) Classify the polymers : 8
 i) on the basis of chemical composition.
 ii) on the basis of molecular forces.

- b) Give preparation, properties and applications of the following : 8
 i) Polycarbonate
 ii) Nitrile Rubber
- c) i) Distinguish between Addition and Condensation Polymerisation. 4
 ii) Explain Vulcanisation of rubber. 4

UNIT - III

3. a) Explain : 8
 i) Setting and Hardening of cement.
 ii) Heat of Hydration.
- b) Give the raw materials required for the preparation of Portland cement and also mention the functions of constituents of Portland cement. 8
- c) i) Give properties and uses of natural cement, Puzzolana cement, slag cement and Portland cement. 4
 ii) Distinguish between Dry and wet process for the manufacture of Portland cement. 4

UNIT - IV

4. a) Explain mechanical properties of ceramics: 8
 b) Give the classification of ceramics with their suitable examples. 8
 c) i) Discuss various traditional Ceramics. 4
 ii) Explain the mechanism of drying of Ceramics wares. 4

UNIT - V

5. a) Give composition, properties and uses of the following : 8
 i) Duralumin
 ii) Aluminium bronzes.
- b) What are alloys? Explain physical properties of metals (any eight) 8
- c) i) Explain applications of Alloy steels. 4
 ii) Distinguish between Ferrous Alloy and Non Ferrous Alloy. 4

Seat Number

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Elements of Civil Engineering & Engg. Mechanics (New) (101104)

P. Pages : 4

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub - questions from each unit.
5. Figures to the right indicate full marks.
6. Use of non - programmable calculator is allowed.

UNIT - I

1. a) State lami's theorem and determine resultant of following force system as shown in fig (i) 8

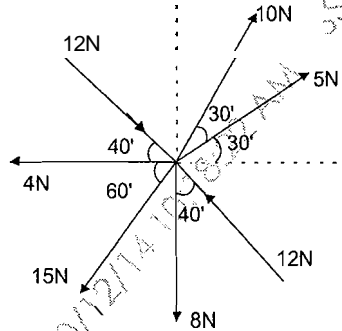


Fig. 1

- b) a roller of weight 500N has a radius of 120mm and is pulled over a step of height 60mm by a horizontal force P find magnitude of P to just start the roller over the step Ref fig (2) 8

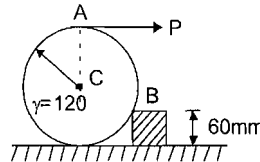


Fig. 2

- c) Find reactions at the supports for the given beam loaded shown in Fig. (3). 8

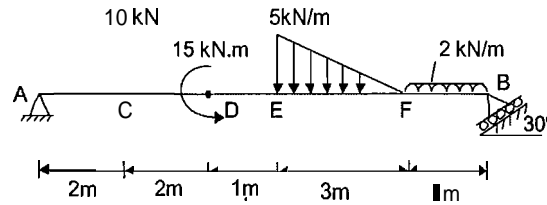


Fig. 3

UNIT - II

2. a) Differentiate between centroid and centre of gravity and solve A homogeneous wire is bent as shown in fig (4) and suspended from point A find angle that AB makes with vertical. 8

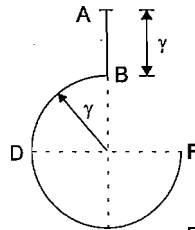


Fig. 4

- b) Determine forces in all the members of the plane truss as shown in fig (5). 8

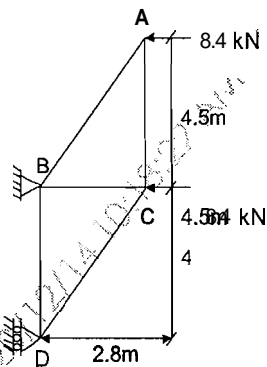


Fig. 5

- c) Define Angle of friction and angle of repose and solve find whether a cylinder at 800N will slip or not under the action of a tangential force of 200N as shown in fig (6) Take $\mu = 0.5$ at all surfaces of contact. 8

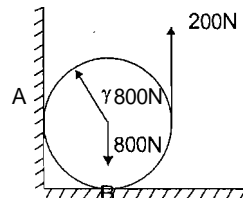


Fig. 6

3. a) A small part in mechanism travels on straight line such that its position is $X = t^4 - 10t^2 + 24$ where X in m and t in sec. Determine 8
- When velocity is zero
 - When acceleration is zero
 - Minimum speed reached by particle
 - Distance travelled in 3 sec.
- b) A bus starts from rest on a curve of 250m radius and acceleration at constant rate $a_t = 0.6\text{m/s}^2$. Determine the distance and time that the bus will travel before the magnitude of it's total acceleration is 0.75m/s^2 . 8
- c) Derive the equations for Range, maximum height and time of flight for a projectile projected on Horizontal plane. 8
4. a) Masses A and B of 30kg each are connected by light extensible rope passing over a smooth light pulley as shown in fig (7). 8

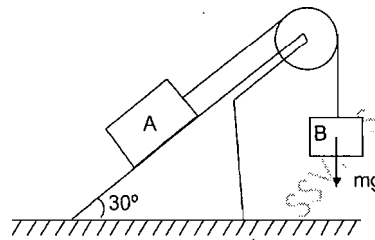


Fig. 7

Mass 'A' slides over a smooth inclined plane inclined at 30° with horizontal if the system is released from rest. Find the distance moved by B in 2 seconds.

- b) i) Write work – energy principle for a particle 4
- ii) Write a short note on Detection of local attraction. 4
- c) The following bearings were taken in traverse survey conducted with a prismatic compass at a place where local attraction was suspected. 8

At what station do you suspect local attraction ? Find the correct bearings of the lines and draw traverse.

Line	Fore Bearing	Back Bearing
AB	$44^\circ 30'$	$226^\circ 30'$
BC	$124^\circ 30'$	$303^\circ 15'$
CD	$181^\circ 00'$	$1^\circ 0''$
DA	$289^\circ 30'$	$108^\circ 45'$

UNIT - V

5. a) i) Explain significance of Civil Engineering. 4
- ii) Write a short note on 'Quantity Surveying'. 4
- b) i) Write a short note on importance of highways as a Civil Engineering Structure. 4
- ii) Explain the practical applications of surveying in construction field. 4
- c) i) Explain 'Circulation principle of planning with sketch. 4
- ii) Define the term 'Grouping' how you will use it for residential building. 4

Seat Number

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चकवा - 013

**Elements of Electronic Engg.
(Old) (1050)**

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions carries equal marks.
5. Solve **any two** from each unit.
6. Assume suitable data, if required.
7. Use of non-programmable calculator is allowed.

UNIT - I

1. Solve any two

- a) Explain VI characteristics of PN junction diode explain drift current mechanism for semiconductor. **10**
- b) Explain transition and diffusion capacitance of PN Junction diode? Also list application of PN Junction diode. **10**
- c) What is difference between Ideal and Real PN Junction diode? Explain Zener breakdown mechanism of Zener diode. **10**

UNIT - II

2. Solve any two

- a) Explain construction and working of N channel JFET? Draw and explain drain and transfer characteristics. **10**
- b) Draw and explain experimental set up for C E (NPN) configuration with input and output characteristics. **10**
- c) Compare CE, CB, CC configuration of BJT. **10**

UNIT - III

Solve **any two**

3. a) Draw and explain well labelled diagram of spectral Response of human eye ? Explain Light Emitting Diode. **10**
- b) With the help of neat diagram Explain the characteristics of SCR? List out application of SCR? **10**
- c) Write short notes on **10**
- UJT as relaxation oscillator
 - TRIAC

UNIT - IV

Solve **any two**

4. a) List the Ideal characteristics of OPAMP? Explain virtual ground concept? Derive the expression of voltage gain of Inverting Amplifier using OPANIP. **10**
- b) Draw and Explain working of Transistor series voltage Regulator circuit. **10**
- c) With input and output waveform Draw and Explain working of Bridge Rectifier? Give its advantage and disadvantage. **10**

UNIT - V

5. Solve **any two**

- a) With the help of neat block diagram Explain CRO with its advantages. **10**
- b) Explain universal Gate? Derive all other gates using both universal gate. **10**
- c) Convert the following **10**
- $(2479)_{10}$ into hexadecimal
 - $(257)_8$ into binary
 - $(1DB)_{16}$ into octal
 - $(753.31)_8$ into hexadecimal

Seat Number

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चकवा - 014

Engineering Physics - I
(New) (101101)

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Use of non – programmable calculator is allowed.
5. Attempt **any two** sub questions from each unit.

UNIT – I

- 1 a) Define nuclear fission. Draw neat and labelled diagram of nuclear reactor, explain function of each part of reactor. **8**
- b) i) What is wind energy ? Explain power generation by windmill. **4**
- ii) Draw an array of solar cell which provides 200 mA current and 6 volts at the output. Also calculate the total number of cells required. **4**
Given : Each cell provides 0.5 volts and current 50 mA. Continuously.
- c) i) Draw construction of solar cell state its applications. **4**
- ii) In a nuclear reactor the fission of U^{235} atom yields 200 MeV energy. If energy of 3.7 kg of Uranium is consumed in a day, find the power output of the reactor assuming that reactor is 20% efficient. **4**
Given Avogadro's no = 6.03×10^{26} kg – mole.

चकवा - 014

P.T.O

UNIT - II

2. a) Explain with neat and labelled diagram construction and working of Helium - Neon gas laser. 8
- b) i) Explain principle of working of optical fibre. 4
- ii) A fiber cable has an acceptance angle 30° and core index of refraction of 1.4. Calculate the refractive index of the cladding. 4
- c) i) Define : 4
- i) Absorption ii) Metastable state
- iii) Spontaneous Emission iv) Population Inversion.
- ii) The numerical aperture of optical fibre is 0.2 when surrounded by air. Determine the refractive index of its core given the refractive index of cladding as 1.5g. Also find the acceptance angle when it is in a medium of refractive index 1.33. 4

UNIT - III

3. a) Explain production of x-ray by Coolidge tube method ? State any four applications of x-ray. 8
- b) i) Define : 4
- i) Basis ii) Unit cell
- iii) Packing factor iv) Space lattice.
- ii) An x-ray tube works at 15kv and at a current of 1.6 mA. Calculate the minimum wavelength and number of electrons that strikes the target per second. 4
- Given :- $e = 1.6 \times 10^{-19} \text{ C}$, $h = 6.62 \times 10^{-34} \text{ J.s}$, $C = 3 \times 10^8 \text{ m/s}$.
- c) i) State important features of miller's indices. 4
- ii) Polonium belongs to SC lattice. If the lattice constant is 3.36 \AA , Calculate its density. Atomic mass of polonium is 20g. Avogadro's No. $6.02 \times 10^{26} \text{ atoms / k - mole}$. 4

UNIT - IV

4. a) Using Fermi - Dirac probability distribution function, derive expression for the position of Fermi level in an intrinsic semiconductor. Also show the position of Fermi level in an extrinsic semiconductor. 8

- b) i) Distinguish between N-type and P-type semiconductor. 4
- ii) An n-type of semiconductor is to have a resistivity 10 ohm-cm. Calculate the numbers of donor atom which must be added to achieve this. 4
Given :- Mobility of donor atom = 500 cm²/v-sec.
- c) i) Explain following term's in brief. 4
i) Valence band ii) Conduction band
iii) Forbidden gap.
- ii) An n-type semiconductor specimen has a Hall coefficient $R_H = 3.66 \times 10^{-11} \text{ m}^3/\text{A-S}$. The conductivity of the specimen is found to be $112 \times 10^7 \text{ ohm-m}$. Calculate the charge carrier density and the electron mobility at room temperature. 4

UNIT - V

5. a) Draw the diagram of Michelson's interferometer. Explain its use to. 8
i) Determine wavelength of unknown light.
ii) Determine thickness of transparent material.
- b) i) Distinguish between interference and diffraction. List any three applications of interference. 4
- ii) A diffraction grating has 5000 lines per cm and the total width of 5 cm. Calculate for wavelength 6790 \AA in second order. 4
i) Resolving power of grating.
ii) The smallest value of $d\lambda$ which can be resolved
- c) i) State and explain law of malus. 4
- ii) At a certain temperature the critical angle of incidence of water for total internal reflection is 48° for a certain wavelength. What is the polarizing angle and the angle of refraction for a light incident on the water at an angle that gives maximum polarization of the reflected light (Given: $\sin 48^\circ = 0.7431$). 4

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Seat Number

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Computer Programming (New) (101105)

P. Pages : 2

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt any two sub-questions from each unit.
5. Write proper comments for C and C++ programs."
6. Assume suitable data wherever necessary & state the assumptions made.
7. Use of drawing instruments and non-programmable calculator is permitted.

UNIT - I

1. a) Write a program In C to compute area of circle and draw the flowchart for the same 8
Given area = $3.14 * r * r$
- b) Write a short note on assemble language and machine language with advantages and disadvantages. 8
- c) Explain with example sequence, repetition and decision statements in algorithm in algorithm. 8

UNIT - II

2. a) Write a C program to check is the number is even of odd and draw the flowchart for the same. 8
- b) Give the syntax and explain with example while loop and for loop. 8
- c) Explain with example different types of operators in C. 8

UNIT - III

3. a) Write a C program for finding sum and average of all array elements (1D array). 8
- b) Give the syntax for different string handling library functions in C. and write a C program to copy one string into another using string library function. 8
- c) What is array? Explain array types with their declaration and initialization. 8

UNIT - IV

4. a) Write a C program for processing student record using structure. 8
- b) Define function. Explain with example function declaration and function definition. 8
- c) Write an algorithm for calculating square of a number using function and write a C program for the same. 8

UNIT - V

5. a) Write a note on 8
 1) inheritance
 2) Polymorphism
- b) Explain class and object. Write a C ++ program to add 2 integer numbers using class and object. 8
- c) Explain scope resolution operator with example. Write the advantages of object oriented programming. 8

Seat Number

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Engineering Mechanics (Old) (1060)

P. Pages : 6

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Answer **any two** questions from each unit.
5. Assume suitable data if necessary.
6. Use of non programmable calculator is allowed.
7. Figures to the right indicates full marks.

UNIT - I

1. a) Explain equilibrant.

2

b) For given system determine :

8

- a) the required value of α if resultant of 3 forces is to be vertical.
- b) the corresponding magnitude of resultant ref. fig.1.

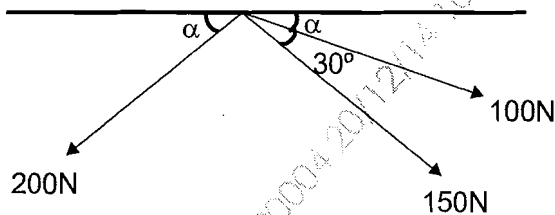


Fig.1

15. A collar A slides along the rotating rod OB. The angular position of rod is given by $\theta = \frac{2}{3} \pi t^2$ radians and position of collar from O is given by $\gamma = 18t^4 + 4m$. Determine velocity and acceleration of collar at $t = 0.4$ sec. Also find the relative acceleration of collar with respect to the rod. 10

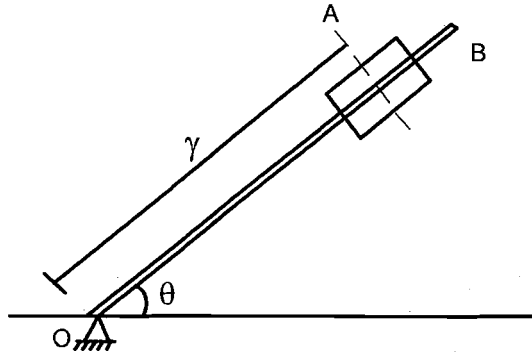


Fig. 11

Seat Number

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Engineering Thermodynamics (Old) (1150)

P. Pages : 3

Time : Four Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. From each questions solve **any two** subquestion.
5. Use of steam table, Mollier chart, non-programmable calculator is Allowed.
6. Assume suitable data if necessary.
7. Neat diagrams must be drawn wherever necessary.

1. a) Explain the terms with examples. 10
 - i) Open system.
 - ii) Closed system.
 - iii) Isolated system.
 - iv) Homogeneous system.
 - v) Heterogeneous system.
- b) Prove that for change in state of closed system $Q = \Delta U + W$ in the absence of Motion and gravity effects. 10
- c) A turbine is supplied with steam at a gauge pressure of 1.4Mpa. 10
After expansion in the turbine the steam flows into Condenser which is maintained at a Vacuum of 710 mm Hg. The barometric pressure is 772 mm Hg. Express the inlet and exhaust steam pressures in Pascal's (absolute). Take the density of mercury as $13.6 \times 10^3 \text{ kg/m}^3$.
2. a) Prove that in a reversible steady flow process work done by system is equal to $-\int v dp$ when changes in KE and PE are insignificant. 10

1

1

Seat Number

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चक्रवा - 001

Elements of Electrical & Electronics Engineering
(New) (102114)

P. Pages : 3

Time : Three Hours

Max. Marks : 80

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub-questions from each unit.
5. Diagram / sketches should be given whenever necessary.
6. Figures to the right indicate full marks.

UNIT - I

1. a) Define following terms.

8

- i) Ideal & practical voltage source.
- ii) Ideal & practical current source.
- iii) Node & loop.
- iv) KVL & KCL.

b) Find the current 'I' supply by battery from circuit as shown in fig. 1.

8

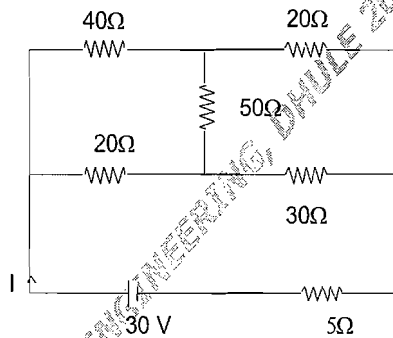


Fig. 1

चक्रवा - 001

P.T.O

- c) State super position theorem. Find current through branch 'AB' using superposition theorem, from ckt as shown in fig. 2. 8

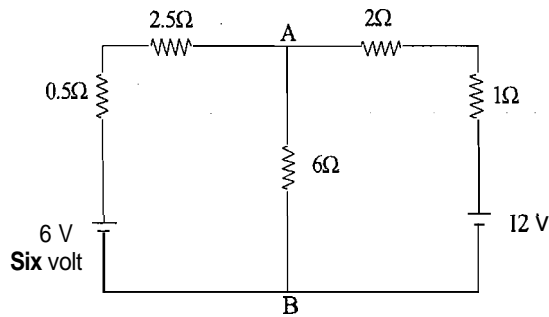


Fig. 2

UNIT - II

2. a) Two impedances $Z_1 = 6 + j 8 \Omega$ & $Z_2 = 5 + j 12 \Omega$ are connected in series across a 100 V, 50 Hz supply, calculate 8
- P.f of the circuit
 - Total Active, reactive & Apparent power consumed.
 - Draw relevant phasor diagram.
- b) With the help of construction, Explain generation of single phase alternating voltage. 8
- c) Derive the Expression for current & voltage for purely inductive circuit with corresponding waveforms. Also draw phasor diagram. 8

UNIT - III

3. a) i) Derive the relation between α_{dc} & β_{dc} . 8
- Compare CC, CB & CE.
- b) Explain zener diode in details with it's symbol & V-I characteristics. 8
- c) Explain input & o/p characteristics of common base configuration. 8

UNIT - IV

4. a) Derive the expression for closed loop gain of inverting & Non inverting Amplifier using op - Amp. 8

- b) Write a short note on
- i) RTD 4
- ii) Strain gauge 4
- c) Define load & line regulation. Explain the zener shunt regulator in details. 4

UNIT - V

5. a) Draw & explain half adder & full adder with it's truth table. 8
- b) Realise the following logical Expression using only NAND gate. 4
- i) $Y = A + B + \bar{A} \cdot \bar{B}C$ 4
- ii) $Y = A + \bar{B} + \bar{C}D$
- c) i) Draw the block diagram of 8051 microcontroller. 4
- ii) List safety precautions while working with electricity. 4

Seat Number

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Engineering Thermodynamics (Old) (1150)

P. Pages : 3

Time : Four Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. From each questions solve **any two** subquestion.
5. Use of steam table, Mollier chart, non-programmable calculator is Allowed.
6. Assume suitable data if necessary.
7. Neat diagrams must be drawn wherever necessary.

1. a) Explain the terms with examples. 10
 - i) Open system.
 - ii) Closed system.
 - iii) Isolated system.
 - iv) Homogeneous system.
 - v) Heterogeneous system.
- b) Prove that for change in state of closed system $Q = \Delta U + W$ in the absence of Motion and gravity effects. 10
- c) A turbine is supplied with stem at a gauge pressure of 1.4Mpa. 10
After expansion in the turbine the steam flows into Condenser which is maintained at a Vacuum of 710 mm Hg. The barometric pressure is 772 mm Hg. Express the inlet and exhaust steam pressures in Pascal's (absolute). Take the density of mercury as $13.6 \times 10^3 \text{ kg/m}^3$.
2. a) Prove that in a reversible steady flow process work done by system is equal to $-\int v dp$ when changes in KE and PE are insignificant. 10

- c) A cylinder has a capacity of 300 litre and Contains oxygen at a pressure of 3.1 MN/m^2 and temperature 18°C . The stop valve is opened and some gas is used. If the pressure and temperature of the gas left in the cylinder falls to 1.7 MN/m^2 and 15°C respectively determine the mass of oxygen used. 10

If after the stop valve is closed the oxygen remaining in the cylinder gradually attains its initial temperature of 18°C determine the amount of heat transferred through the cylinder wall from atmosphere.

The desity of oxygen at 0°C and 0.1013 MN/m^2 may be taken as 1.43 kg/m^3 , C_p/C_v of oxygen 1.4.

5. a) Explain the terms wet steam, dry steam, superheated steam, and dryness fraction. Why the term dryness fraction is not applicable to Superheated steam. 10
- b) What is critical point & triple point? What are critical point parameters? What is its significance? State value of critical point parameter for water. 10
- c) Explain with neat diagram the working of combined Separating and throttling parameter. 10

Seat Number

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Engineering Thermodynamics (Old) (1150)

P. Pages : 3

Time : Four Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. From each questions solve **any two** subquestion.
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6. Assume suitable data if necessary.
7. Neat diagrams must be drawn wherever necessary.

1. a) Explain the terms with examples. 10
 - i) Open system.
 - ii) Closed system.
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- c) A turbine is supplied with steam at a gauge pressure of 1.4Mpa. 10
After expansion in the turbine the steam flows into Condenser which is maintained at a Vacuum of 710 mm Hg. The barometric pressure is 772 mm Hg. Express the inlet and exhaust steam pressures in Pascal's (absolute). Take the density of mercury as $13.6 \times 10^3 \text{ kg/m}^3$.
2. a) Prove that in a reversible steady flow process work done by system is equal to $-\int v dp$ when changes in KE and PE are insignificant. 10

- b) Write down steady Flow Energy Eqⁿ and N. F. E. E. Prove the following relations. 10
- $-\int v dp = Q - \Delta H$ when changes in K.E & P.E are neglected.
 - $\int p dv = Q - \Delta U$ when changes in KE & P.E. are neglected.
 - $W_{\text{steady flow}} - W_{\text{nonflow}} = \Delta PV$.
- c) In Water Cooled Compressor 0.6 kg of air is Compressed per second. Power required to run the Compressor is 40 kw. Heat Lost to cooling water is 30% of input and 10% of input is Lost in bearings and other frictional effects. Air enters the compressor at 1 bar and 30°C. If the changes in potential energy and kinetic energy are neglected estimate the exit temperature of air. Take $C_p = 1.005 \text{ kJ/kg}^\circ\text{C}$. 10
3. a) Write down limitation of First Law of Thermodynamics. Give the statements of Second Law & Thermodynamics. Prove the equivalence of Kelvin-planck and Clausius Statements. 10
- b) Explain Carnot Cycle in detail and derive relation for efficiency in terms of temperature. 10
- c) A heat pump is used to maintain an auditorium hall at 25°C when the atmospheric temperature of 10°C. The heat Load of the hall is 1500 kJ/min. Calculate the power required to run the actual heat pump if the COP of the actual heat pump is 30% of the COP of Carnot heat pump working between the same temperature limits. 10
4. a) For polytropic process prove that Heat Supplied 10
- $$Q = \frac{\gamma - n}{\gamma - 1} \times \text{work done in nonflow polytropic process.}$$
- b) i) Prove that $p v^\gamma = \text{const.}$ For an adiabatic process 6
- ii) Derive Eqⁿ of state of an ideal gas. 4