# Common All Branches

# Bachelor Of Engineering

# Question Papers  May-June 2019

# Sem – I & II

10th May

FE (I) (CBC(2S) (ALL BRANCHES) 2019

choice Based

( 3 Hours )

[ Total marks : 80 ]

Note :-
1) Question number **1** is compulsory.
2) Attempt any **three** questions from the remaining **five** questions.
3) **Figures** to the **right** indicate **full** marks.

Q.1   a)   If $u = \log\left(\frac{x}{y}\right) + \log\left(\frac{y}{x}\right)$, find $\frac{\partial u/\partial x}{\partial u/\partial y}$   03

b)   Find the value of $\tanh(\log x)$ if $x = \sqrt{3}$   03

c)   Evaluate $\lim\limits_{x \to 3}\left[\frac{1}{x-3} - \frac{1}{\log(x-2)}\right]$   03

d)   If $u = r^2\cos 2\theta$   $v = r^2\sin 2\theta$, find $\frac{\partial(u,v)}{\partial(r,\theta)}$   03

e)   Express the matrix $A = \begin{pmatrix} 2+3i & 2 & 3i \\ -2i & 0 & 1+2i \\ 4 & 2+5i & -i \end{pmatrix}$ as the sum of a   04

Hermitian and a Skew-Hermitian matrix.

f)   Expand $\tan^{-1}x$ in powers of $\left(x - \frac{\pi}{4}\right)$   04

Q.2   a)   Expand $\sin^7\theta$ in a series of sines of multiples of $\theta$   06

b)   If $y = \sin^2 x\cos^3 x$, find $y_n$   06

c)   Find the stationary values of $x^3 + y^3 - 3axy,\ a > 0$   08

Q. 3   a)   Compute the real root of $x\log_{10}x - 1.2 = 0$ correct to three places   06
of decimals using Newton-Raphson method.

b)   Show that the system of equations   06
$2x - 2y + z = \lambda x,\ \ 2x - 3y + 2z = \lambda y,\ \ -x + 2y = \lambda z$
can posses a non-trivial solution only if $\lambda = 1, \lambda = -3$. Obtain the
general solution in each case.

c)   If $\tan(\alpha + i\beta) = \cos\theta + i\sin\theta$, prove that   08
$\alpha = \frac{n\pi}{2} + \frac{\pi}{4}$ and $\beta = \frac{1}{2}\log\tan\left(\frac{\pi}{4} + \frac{\theta}{2}\right)$

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Q. 4 a) Using the encoding matrix as $\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$, encode and decode the message MOVE 06

b) If $u = f(e^{x-y}, e^{y-z}, e^{z-x})$ then prove that $$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$$ 06

c) If $y = a\cos(\log x) + b\sin(\log x)$, then show that $$x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$$ 08

Q. 5 a) If $1, \alpha, \alpha^2, \alpha^3, \alpha^4$, are the roots of $x^5 - 1 = 0$, find them and show that $(1-\alpha)(1-\alpha^2)(1-\alpha^3)(1-\alpha^4) = 5$ 06

b) If $\theta = t^n e^{-r^2/(4t)}$,
Find $n$ which will make $\frac{\partial \theta}{\partial t} = \frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2 \frac{\partial \theta}{\partial r}\right)$ 06

c) Find the root (correct to three places of decimals) of $x^3 - 4x - 9 = 0$ lying between 2 and 3 by using Regula-Falsi method. 08

Q. 6 a) Find non-singular matrices $P$ and $Q$ such that
$A = \begin{pmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{pmatrix}$ is reduced to normal form. Also find its rank. 06

b) Find the principle value of $(1+i)^{1-i}$ 06

c) Solve the following equations by Gauss-Seidel method
$27x + 6y - z = 85$
$6x + 15y + 2z = 72$
$x + y + 54z = 110$
(Take three iterations) 08

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FE | Sem-I | choice based | 16 | 5 | 2019

[3 Hours]

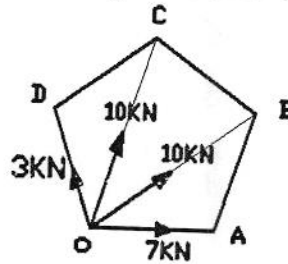NB:                                                                    [Marks 80]

1. Question No: 1 is compulsory.
2. Attempt any three questions out of remaining five questions.
3. Assume suitable data if necessary and mention the same clearly.
4. Draw suitable sketches whenever necessary.

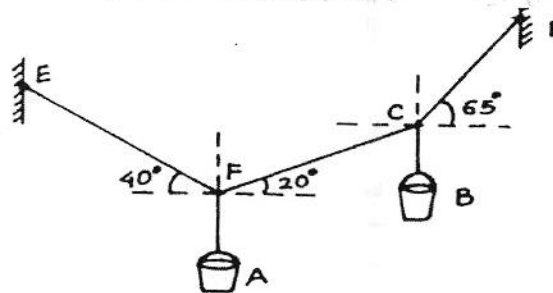1. Attempt Any Four :
a) Find the resultant of forces as shown in fig.                        (05)
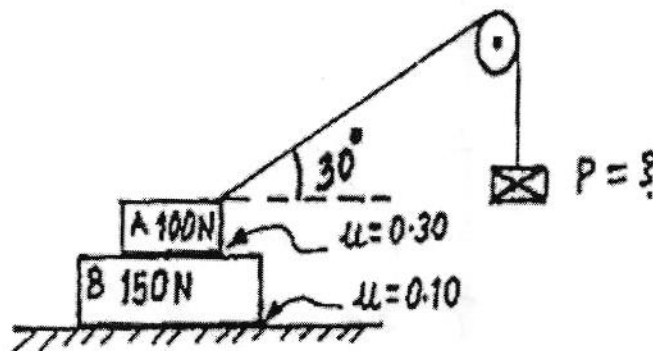


b) If the cords suspend the two buckets in equilibrium position shown in Fig. Determine
   weight of bucket B if Bucket A has a weight of 60N.                   (05)



c) Two blocks A=100N and B=150N are resting on the ground as shown in the fig. Find the
   minimum weight P in the pan so that body A starts. Assume pulley to be mass less and
   frictionless.                                                        (05)

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d) The motion of jet plane while travelling along a runway is defined by the v– t graph as shown in Fig. Construct the s – t graph for the motion. The plane starts from rest. **(05)**
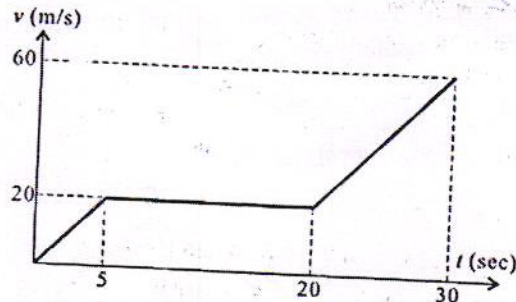


A 50 kg block is kept on the top of a 15° slopping surface is pushed down the plane with an initial velocity of 20m/s. If $\mu k = 0.4$, determine the acceleration of the block. **(05)**

2. Attempt:

a) Four forces acting on a rectangle in the same plane as shown in fig below. Find magnitude and direction of the resultant force. Also find intersection of line of action of resultant with X and Y axes, assuming D as origin. **(06)**
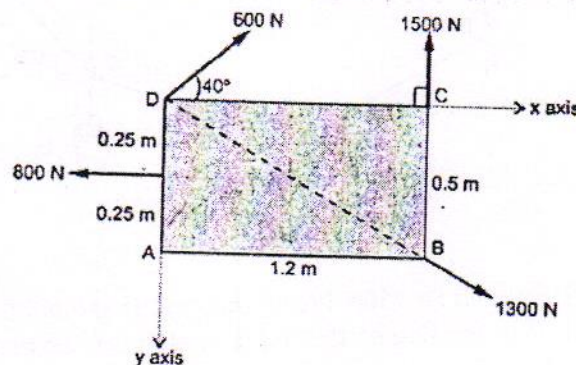


b) Two spheres A and B of weight 1000N and 750N respectively are kept as shown in fig. Determine the reactions at all contact points 1, 2, 3 and 4. Radius of A = 400 mm and B = 300 mm. **(08)**

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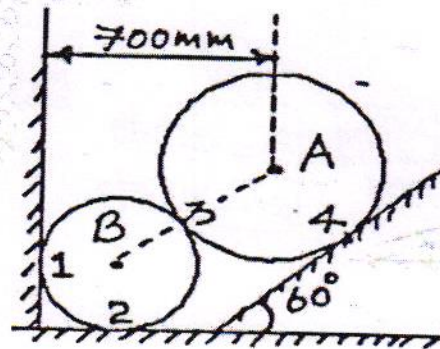
c) Two smooth balls A (mass 3 kg) and B (mass 4kg) are moving with velocities 25 m/s and 40 m/s respectively. Before impact, the directions of velocity of two balls are 30° and 60° with the line joining the centers as shown in Fig. If e = 0.8, find the magnitude and direction of velocities of the balls after impact. (06)
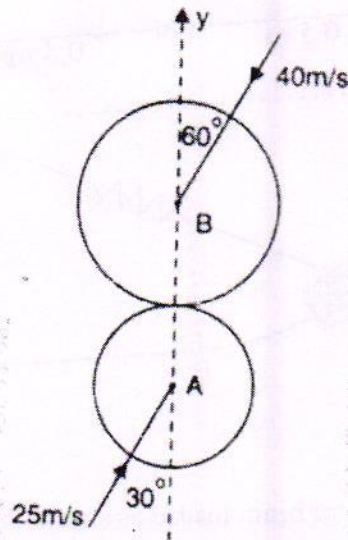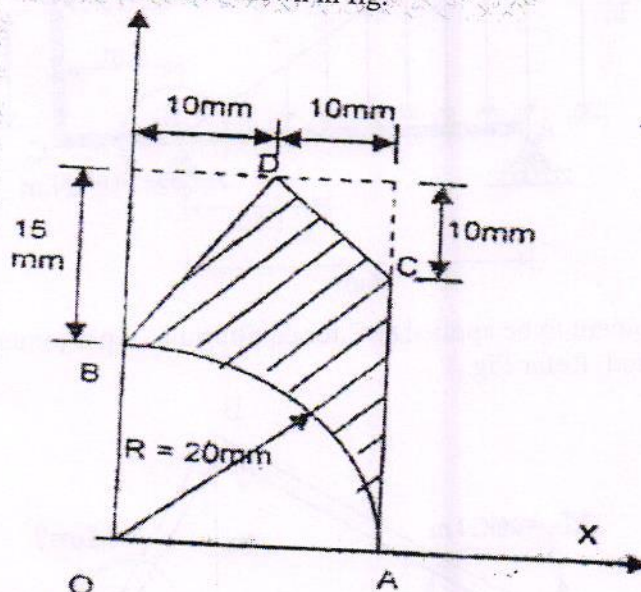


3. Attempt:

a) Find the centroid of shaded area as shown in fig. (08)



b) Three forces F₁, F₂ and F₃ act at the origin O. $F_1$ = 70 N acting along OA, where A (2, 1, 3). $F_2$ = 80N acting along OB, where B (-1, 2, 0). $F_3$ = 100 N acting along OC, where C (4, -1, 5). Find the resultant of these concurrent forces. (06)

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c) A 4kg collar is attached to a spring, slides on a smooth bent rod ABCD. The spring has constant k = 500 N/m and is undeformed when the collar is at 'C'. If the collar is released from rest at A. Determine the velocity of collar, when it passes through 'B' and 'C'. Also find the distance moved by collar beyond 'C' before it comes to rest again. Refer Fig. **(06)**
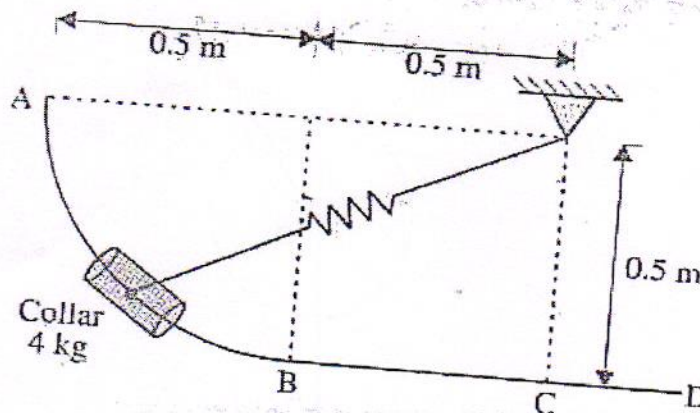


4. Attempt:

a) Find the support reactions of beam loaded as shown in fig. **(08)**



b) Determine the moment to be applied at C for equilibrium of pin jointed mechanism. Use virtual work method. Refer Fig. **(06)**

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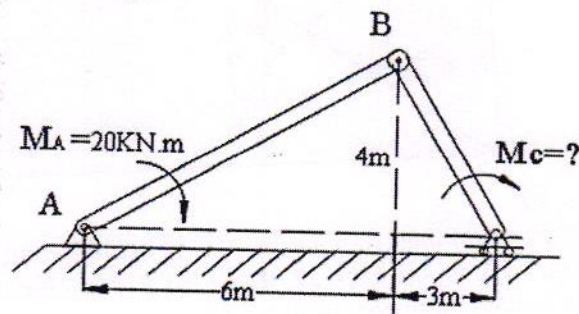
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c) A slider crank mechanism is shown in Fig. The crank OA rotates anticlockwise at 100 rad/s. Find the angular velocity of rod AB and the velocity of the slider at B. **(06)**
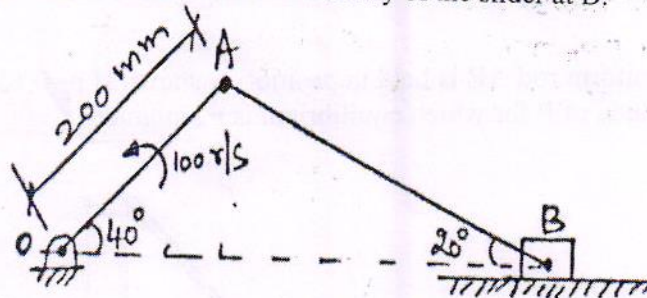


5. Attempt:

a) Find the forces in the members BC, BE and AE by method of sections and remaining members by method of joints. **(08)**



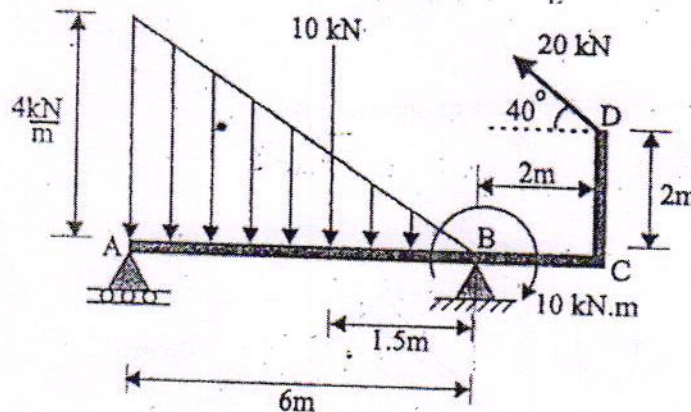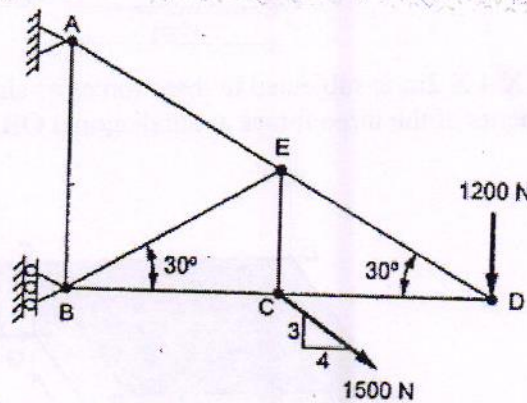b) A particle moves in x-y plane and its position is given by $r = (3t)i + (4t-3t^2)j$, where r is the position vector of particle in meters at time t sec. Find the radius of curvature of the path and normal and tangential components of acceleration when it crosses X-axis again. **(06)**

c) C is a uniform cylinder to which a rod AB is pinned at A and the other end of the rod B is moving along a vertical wall as shown in Fig – 4. If the end B of the rod is moving upwards along the wall with a speed of 3.3 m/s find the angular velocity of wheel and rod assuming that cylinder is rolling without slipping. **(06)**

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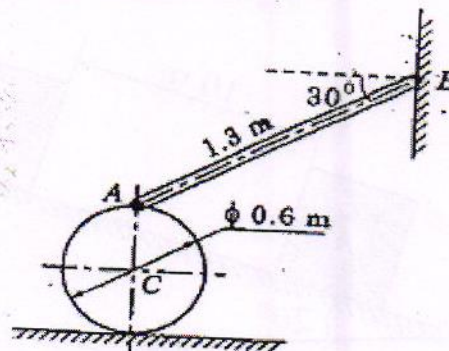
6. Attempt:

a) A 100N uniform rod AB is held in position as shown If $\mu=0.15$ at A and B calculate range of value of P for which equilibrium is maintained. **(08)**
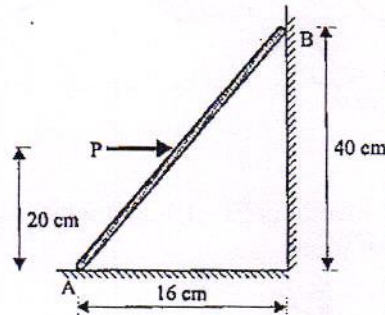
b) A box of size 3 X 4 X 2m is subjected to three forces as shown in fig. Find in vector form the sum of moments of the three forces about diagonal OB. **(06)**
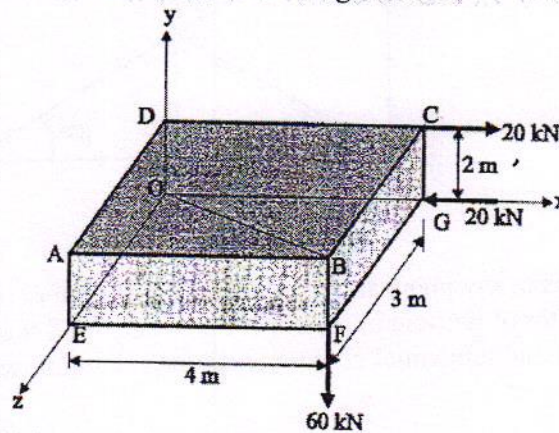
c) Two blocks A and B are separated by 10 m as shown in Figure on a 20° incline plane. If the blocks start moving, find the time t when the blocks collide and distance travelled by each block. Assume $\mu k = 0.3$ for block A and plane and $\mu k = 0.10$ for block B and plane. **(06)**

Fig.

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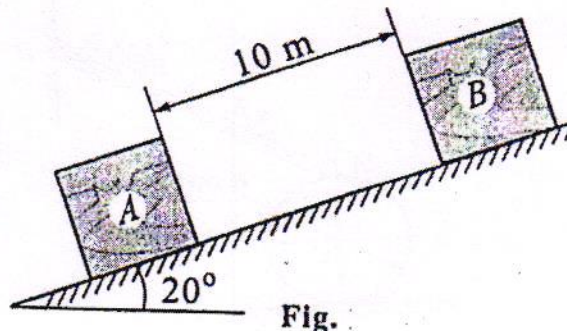
(3 Hours)                                                    Total Marks: 80

N. B.1) Question No. **1** is **compulsory**.
   2) Answer any **3** questions from the remaining **5** questions.
   3) Assume suitable data wherever necessary.

Q1   Attempt any *five* of the following                                    20
   (a) Explain the working principle of Single Phase Transformer.
   (b) Derive the formula to convert a Star circuit into equivalent Delta.
   (c) Explain the principle of operation of DC motor.
   (d) What is the necessary condition for resonance in series circuit? Derive the
       expression   for resonance frequency.
   (e) Find the value of R in the following circuit.
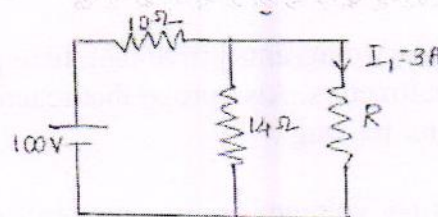


   (f) Find the current through 4Ω resistor by source transformation in the
       following circuit;

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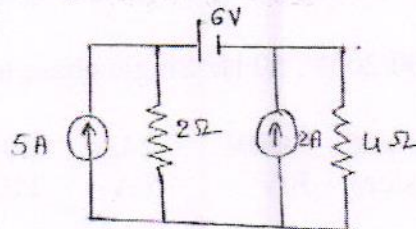
Q2  a) Determine the current through 8Ω resistor in the following Network by     8
        superposition theorem;
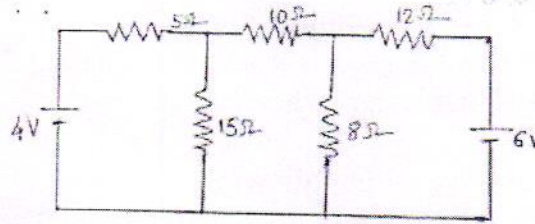


   (b) An Inductive coil having inductance of 0.04H and resistance 25Ω has been     8
       connected in series with another inductive coil of inductance 0.2H and
       resistance 15Ω. The whole circuit is powered with 230V, 50Hz mains.
       Calculate the power dissipation in eachcoil and total power factor.

   (c) What are the losses in transformer? Explain why the ratings of transformer     4
       in KVA not in KW

Q3  (a) With necessary diagrams prove that three phase power can be measured by     10
        only two wattmeters. Also prove that reactive power canbe measured from
        the wattmeter reading .

   (b) An alternating  voltage is represented by $v(t)=141.4 \sin(377t)$ V, Derive the     10
       RMS value of the voltage.

       Find
       i)      Instantaneous voltage value  at t=3ms
       ii)     The time taken for voltage to reach 70.7 V for first time.

Q4  (a) State and prove Maximum power transfer Theorem.     8

   (b) A 5KVA 1000/200V, 50 Hz Single phase transformer gave the following     12
       test result
       OC TEST( hv side): 1000V    0.24A    90 W
       SC TEST(hv side) : 50V        5 A      110 W

       Calculate
         i.    Equivalent circuit for transformer with circuit constant
         ii.   Regulation at full load at 0.8 lagging
         iii.  kVA load for maximum efficiency.

Q5  (a) Three similar coils each having a resistance of 10Ω and inductance 0.04 H     8
        are connected in star across 3-phase 50Haz, 200V supply. Calculate the line
        current,  total power absorbed, reactive colt amperes and total volt amperes.

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(b) In the following circuit find R for maximum power delivered to it. Also find maximum power delivered $P_{max}$.     8
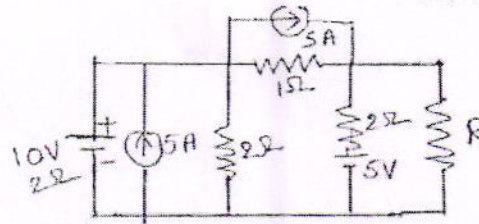


(c) Two impedances $12+j16\Omega$ and $10-j20\Omega$ are connected in parallel across 230V, 50Hz Single phase ac supply. Find kW, kVA and kVAR and Power factor.     4

Q6 (a) Draw and Explain the phasor diagram for the practical transformer connected to lagging power factor.     6

(b) Find i) average value   ii) rms value.

    10
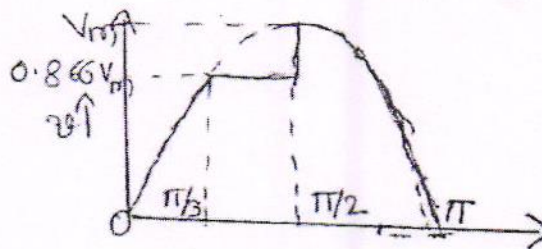


c) State and Explain Thevenin's theorem and Norton's theorem     4

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F.E sem-I (All branches) choice based 28/05/2019

Time : 2 Hrs                                                    Marks : 60

N.B.   1. Question No.1 is compulsory.
       2. Attempt any three from Q.2 to Q.6
       3. Draw neat diagram and write chemical reactions where necessary.
       4. Figures to right indicate full marks.

**Atomic weights:**
H = 1, C = 12, N = 14, O = 16, Na = 23, Mg = 24, S = 32, Cl = 35.5, K = 39,
Ca = 40

**Q.1]**   Answer any five from the following:-                                    15

(a)   Write a brief note on Reverse Osmosis.

(b)   Write methods of preparation, properties and uses of polyurethane rubber.

(c)   Define and discuss giving significance of the following

           (i) Viscosity    (ii)Cloud Point

(d)   Write advantages and drawback of Phase Rule.

(e)   A hard water sample contains following impurities (in mg/L)
      $Mg(HCO_3)_2 = 150$ ;   NaCl = 77 ;   $CaCl_2 = 135$;   $MgSO_4 = 85$.
      Calculate temporary, permanent and total hardness of the given sample
      of water.

(f)   Discuss the effect of temperature on polymers.

(g)   Why gypsum is added during manufacturing of the cement?

**Q.2]**   A hard water sample has following composition                            6
(a)
      $CaSO_4 = 170mg/L$;   $Ca(HCO_3)_2 = 130mg/L$;   $Mg(HCO_3)_2 = 95mg/L$;
      HCl = 58mg/L;   $KNO_3 = 75mg/L$

      Calculate lime (90% pure) and soda (95% pure) required for complete softening
      of one million liters of above hard water sample.

(b)    (i) What is Glass transition temperature?                                    3

      (ii) What are semi sold lubricants? Under which conditions they are used?      2

(c )   Explain briefly Carbon nanotubes by CVD method.                              4

**Q.3]**   What is Natural rubber? What is vulcanized of rubber?  Compare the properties   6
(a)       of vulcanized rubber over natural rubber.

(b)    (i)  What is 'Triple Point'? Write the condition at which triple point exists for   3
      water system.
                                                                                   2
      (ii) What are Fullerenes? Write important properties and uses of Fullerene.

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(c) In the process of determination of hardness, a standard hard water sample was prepared by dissolving 2.5g $CaCO_3$ and making solution upto one liter. 50ml of above hard water required 45 ml of EDTA. 50ml of unknown hard water sample was titrated it required 30ml of same EDTA. The unknown hard water sample was boiled and filtered. 50ml of this boiled sample required 20ml of EDTA. Calculate hardness of all types of unknown hard water sample. **4**

**Q.4]**
(a) Draw a neat labeled diagram and explain zeolite process of softening of hard water. Discuss its merits and demerits. **6**

(b) (i) 10g of lubricating oil was heated with 25ml of 50%alcohol, the resultant mixture required 25ml of N/10 KOH. The blank reading was obtained to be 8ml of same KOH. Calculate acid value of the lubricating oil. **3**

(ii) Explain the terms: (a) Concrete (b) RCC **2**

(c) Explain the importance of polymers in the field of surgery and medicine. **4**

**Q.5]**
(a) What is compounding of plastic? Explain the role played by various constituents used during manufacturing of plastic. **6**

(b) (i) Define and briefly explain

        Biological Oxygen Demand (BOD )

        Chemical Oxygen Demand (COD). **3**

(ii)Write important functions of lubricants. **2**

(c) Draw and explain phase diagram of Pb-Ag system. **4**

**Q.6]**
(a) Draw a neat diagram and explain the mechanism of thick film lubrication. **6**

(b) (i) Write Gibb's mathematical equation of phase rule and define the terms involved in it. **3**

(ii) With chemical equations, explain role played by bleaching powder in water treatment. **2**

(c) Explain manufacturing of the cement by wet process materials **4**

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F.E. (Sem-I) (All Branches) (Choice based) - 03/05/2019
Evening

(2 Hours)　　　　　　　　　　　　　　　　　　[Total Marks: 60]

1. Q. No.1 is compulsory.
2. Attempt any three from Q.No.2 to Q.No.6.
3. Assume suitable data wherever required.
4. Figures to the right indicate maximum marks.

Q1.　Answer any five from the following questions. (3 marks each)　　　　[15]

    a.　Draw the following for a cubic unit cell. $[\bar{1}\,2\,\bar{3}]$, $(2\,0\,0)$, $(\bar{2}\,\bar{3}\,0)$
    b.　Show that the Fermi energy level lies at the centre of the band gap in intrinsic semiconductors.
    c.　The mobility of hole is $0.025 m^2/V.s$. What would be the resistivity of p-type Si sample if its Hall coefficient is $2.25 \times 10^{-5} m^3/C$?
    d.　Explain de Broglie's hypothesis of matter waves and deduce the expression for $\lambda$.
    e.　Explain reverberation of sound
    f.　Explain Meissner Effect with the help of diagram.
    g.　Discuss any three applications of Ultrasonic waves.

Q2.　a.　Derive Bragg's equation for X-ray diffraction in crystals. Calculate the glancing angle on　[8]
       a plane $(1\,0\,0)$ of rock salt having lattice constant $2.814 A°$ corresponding to first order Bragg's diffraction maximum for X-rays of wavelength $1.541 A°$.
    b.　What is Hall Effect? Derive an expression for Hall voltage. How can mobility be determined by using Hall Effect?　　　　　　　　　　　　　　　　[7]

Q3.　a.　Derive the relation between density and lattice constant for a cubic crystal. Calculate　[8]
       the lattice constant, atomic radius and packing factor for Chromium having BCC structure. Given density of Chromium is 5.98 gm/cc and atomic weight is 50.
    b.　Explain the formation of P-N junction in equilibrium with energy band diagram and explain its conduction process in forward bias.　　　　　　　　　　　　[7]

Q4.　a.　Differentiate between Type-I & Type-II Superconductors.　　　　　　[5]

    b.　Discuss in details any three factors affecting acoustics of a hall with their remedies　[5]
    c.　Calculate the de Broglie wavelength of alpha particles accelerating through a potential difference of 150 volts. Given mass of Alpha particle is $6.68 \times 10^{-27}$ Kg.　[5]

Q5.　a.　Find the accuracy in the position of an electron moving with speed 350 m/sec with　[5]
       uncertainty of 0.01%..
    b.　A quartz crystal of thickness 1mm is vibrating at resonance. Calculate its fundamental frequency. (Assume that for quartz, $Y=7.9 \times 10^{10} N/m^2$ and $\rho=2.650 gm/cc$.).　[5]
    c.　Calculate electron & hole concentration in intrinsic Si at room temperature if its electrical conductivity is $4 \times 10^{-4}$ mho/m. Given that mobility of electron = $0.14 m^2/V$-sec and mobility of holes = $0.04 m^2/V$-sec.　　　　　　　　　　　[5]

Q6.　Write short notes on the following (any three)　　　　　　　　　　[15]
    a.　Davisson- Germer Experiment
    b.　Maglev
    c.　Bragg's spectrometer
    d.　Crystal defects

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(2 Hours)                                    (Total Marks : 60)

N.B.:   (1) **All** questions are **compulsory**.
        (2) Draw **neat diagrams** wherever **necessary**.
        (3) **Figures** to the **right** indicate **full marks**.

Q.1   Attempt **any five** from the following:-                                    **15M**

a   Define soil depletion. Give the classification of ecosystem.

b   Define pollution. State any four sources of soil pollution.

c   Give the functions (any six) of state pollution control board.

d   Define and give any four objectives of Green building.

e   Define geothermal energy. Draw a neat and labeled diagram of steam turbine power plant.

f   Define and give any four limitations of conventional sources of energy.

g   Define land pollution. State any two sources of soil pollution. Give any two adverse effects of soil pollution.

Q.2   Attempt the following:-                                                      **15M**

(a)   Give the reasons and consequences of cloudburst and landslides at Kedarnath.    **4M**

(b)   Define noise pollution. State any four sources of noise pollution. State any four bad effects of noise pollution. Give the reactions taking place in the environment during acid rain.    **5M**

(c)   Draw a neat and labeled diagram of electrostatic precipitator used for purification of air pollutants. Give the principle involved in electrostatic precipitator. Give any two advantages and disadvantages of electrostatic precipitator.    **6M**

Q.3   Attempt the following:-                                                      **15M**

(a)   Define indoor air pollution. State any four sources of indoor air pollution. State any four bad effects of indoor air pollution.    **5M**

(b)   Draw neat and labelled diagram for solar heater. Give the principle involved in solar heater. Give the working of solar heater.    **5M**

(c)   What is the meaning of sustainable development? Give any four social and economical aspects of sustainable development.    **5M**

Q.4   Attempt the following:-                                                      **15M**

(a)   Give the importance of environmental education. How does Biomass and energy flow are related in ecological pyramid?    **4M**

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(b) Draw a neat and labeled diagram of solar cell. Give the principle involved in solar cell. Give the construction of solar cell. Give any two advantages and disadvantages of solar cell.    6M

(c) Explain the concept of control measures through the concept of Recover. Give the advantages and disadvantages of such program.    5M

Q.5   Attempt the following:-    15M

(a) Define wind energy. Give the principle involved in wind turbines. Give any two advantages and disadvantages of wind energy. Give the construction of wind turbine.    6M

(b) Explain the case study of boiler blast tragedy in Dombivali MIDC.    4M

(c) Define water pollution. State any four sources of water pollution. State any four bad effects of water pollution.    5M

Q.6   Attempt the following:-    15M

(a) Give the importance of environmental education from environmental degradation. Give the causes of depletion of natural water resources.    5M

Define photochemical smog. State any four sources of photochemical smog. State any

(b) four bad effects of photochemical smog.    6M

(c) Explain the case study of earthquake in Latur.    4M

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9ᵗʰ May 2019

F.E / Sem Ⅱ / Choice Based / All Branches.

**Duration – 3 Hours**          **Total Marks: 80**

N.B   1) Question **No. 1** is **Compulsory**.

      2) **Answer** any **three** questions from remaining questions.

      3) Figures to the right indicate full marks.

**Q.1**   a)   Evaluate $\int_0^\infty y^4 e^{-y^6} dy$.      **3**

     b)   Find the circumference of a circle of radius r by using    **3**
parametric equations of the circle $x = r\cos\theta, y = r\sin\theta$.

     c)   Solve $(D^2 + D - 6)y = e^{4x}$.      **3**

     d)   Evaluate $\int_0^1 \int_{x^2}^x xy(x^2 + y^2)dydx$.      **3**

     e)   Solve $(tany + x)dx + (xsec^2y - 3y)dy = 0$.      **4**

     f)   Solve $\frac{dy}{dx} = 1 + xy$ with initial condition $x_0 = 0, y_0 = 0.2$ by    **4**
Euler's method. Find the approximate value $of\ y\ at\ x = 0.4\ with\ h = 0.1$.

**Q.2**   a)   Solve $(D^2 - 4D + 3)y = e^x cos2x + x^2$.      **6**

     b)   Show that $\int_0^\infty \frac{tan^{-1}ax}{x(1+x^2)} dx = \frac{\pi}{2} log(1 + a)$.      **6**

     c)   Change the order of integration and evaluate $\int_0^2 \int_{\frac{x^2}{2}}^{4-x} xy\,dydx$.    **8**

**Q.3**   a)   Evaluate $\iiint x^2yz\,dxdydz$ throughout the volume bounded by    **6**
the planes $x = 0, y = 0, z = 0$ and    $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$.

     b)   Find the mass of lamina of a cardioid $r = a(1 + cos\theta)$.
If the density at any point varies as the square of its distance
from its axis of symmetry.      **6**

     c)   Solve $(3x + 2)^2 \frac{d^2y}{dx^2} + 5(3x + 2)\frac{dy}{dx} - 3y = x^2 + x + 1$.      **8**

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**Q.4** a) Find by double integration the area common to the circles $r = 2cos\theta$ and $r = 2sin\theta$.    **6**

b) Solve $sin2x\frac{dy}{dx} = y + tanx$.    **6**

c) Solve $\frac{dy}{dx} = 3x + y^2$ with initial conditions $y_0 = 1$, $x_0 = 0$ at at x=0.2 in steps of h=0.1 by Runge Kutta method of fourth order.    **8**

**Q.5** a) Evaluate $\int_0^1 x^5 sin^{-1}x\, dx$ and find the value of $\beta\left(\frac{7}{2}, \frac{1}{2}\right)$.    **6**

b) The differential equation of a moving body opposed by a force per unit mass of value cx and resistance per unit mass of value $bv^2$ where x and v are the displacement and velocity of the particle at that time is given by $v\frac{dv}{dx} = -cx - bv^2$. Find the velocity of the particle in terms of x, if it starts from the rest.    **6**

c) Evaluate $\int_0^6 \frac{dx}{1+4x}$ by using i) Trapezoidal ii) Simpsons (1/3)rd and iii) Simpsons (3/8)th rule.    **8**

**Q.6** a) Find the volume of the region that lies under the paraboloid $z = x^2 + y^2$ and above the triangle enclosed by the lines $y = x, x = 0$ and $x + y = 2$ in the xy plane.    **6**

b) Change to polar coordinates and evaluate $\int\int y^2 dxdy$ Over the area outside $x^2 + y^2 - ax = 0$ and inside $x^2 + y^2 - 2ax = 0$.    **6**

c) Solve by method of variation of parameters    **8**
$\frac{d^2y}{dx^2} + y = \frac{1}{1+sinx}$.

\*\*\*\*\*\*\*\*

F.E (Sem II) Choice Base All Branches    15/05/19.

(2 Hours)    [Total Marks : 60]

**N.B.:** (1) Question No. 1 is compulsory
 (2) Attempt any three questions from remaining Question No's 2 to 6
 (3) Assume suitable data wherever required.
 (4) Figures to the right indicate marks.

1. Attempt any <u>Five</u>    (15M)
 a) Explain the formation of colors in thin film when it is exposed to white light.

 b) Write the formula for dispersive power of the grating. Explain how it can be increased.

 c) A bare core optical fiber with no cladding is kept in air medium and has fractional index difference of 1.2 %. Calculate acceptance angle of the fibre.

 d) Differentiate between photography and holography.

 e) Using cylindrical coordinate system, calculate volume of the cylinder of radius r and height h.

 f) An electron is accelerated through a potential difference of 18 kV in a cathode ray tube. Calculate kinetic energy and speed of the electron.

 g) Explain top down and bottom up approaches to prepare nanomaterials.

2.
 a. What is anti-reflection coating? State the conditions for refractive index and thickness of the film in order to act as anti-reflection coating.
 White light is sent vertically downward onto a horizontal thin film that is sandwiched between the materials. The indices of the refraction are 1.8 for top material, 1.65 for thin film and 1.50 for the bottom material. The film thickness is $5 \times 10^{-7}$ m. Which are the visible wavelengths (400 -700 nm) those results in fully constructive interference at an observer above the film?    (8M)

 b. Give the advantageous of optical fiber cables on conventional electrical cables. Calculate core radius required for an optical fibre to act as a single mode fibre if its core refractive index is 1.46 and cladding refractive index is 1.455 and operating wavelength is 1300 nm.    (7M)

3.
 a. Explain Fraunhofer's double slit diffraction experiment and obtain expression for resultant intensity of light on the screen and derive the formula for missing orders in the double slit diffraction pattern.    (8 M)

 b. With energy level diagram explain the construction and working of He-Ne Laser.    (7M)

4.
 a. Calculate divergence of the vector field $\vec{F} = x^2 y\,\vec{i} - (z^3 - 3x)\vec{j} + 4y^2\,\vec{k}$ .    (5 M)

 b. Draw the block diagram of cathode ray oscilloscope (CRO) and explain the importance of time base circuit.    (5 M)

 c. Interference fringes are produced by monochromatic light falling normally on a wedge shaped film of refractive index 1.4. The angle of wedge is 20 seconds of an arc and the distance between successive bright fringes is 0.25 cm. Calculate wavelength of the light used.    (5 M)

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5.

   a. Write Maxwell's equations in differential form and give their physical significance. (5M)

   b. The ground state and excited state of the laser is separated by 1.8 eV. Calculate the ratio of number of atoms in the excited state to the ground state and wavelength of the radiation emitted at $27^0$C

       (5 M)

   c. Explain construction and working of atomic force microscope (AFM). (5 M)

6.

   a. Explain sputtering method for synthesis of nano materials. (5 M)

   b. Explain experimental arrangement of Newton's rings experiment and show that diameters of dark rings are proportional to square root of natural numbers. (5 M)

   c. An electron enters in a uniform magnetic field B = 0.23x $10^{-2}$ wb/m$^2$ at $45^0$ angle to B. Determine radius and pitch of the helical path. Assume electron speed to be 3x$10^7$ m/sec. (5 M)

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[Time: 2 Hours]                                    [Total Marks:60]

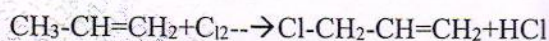Please check whether you have got the right question paper.

N.B:    1.  Question.No.1 is compulsory.

2. Attempt any three questions out of remaining five

3. Figure to the right indicates full marks.

4 Atomic weights C=12,S=32,N=14,H=1,O=16,Cl=35.5.

| | | | |
|---|---|---|---|
| 1 | | Answer **any five** from the following | 15 |
| | (a) | Define octane number and write its significance. | |
| | (b) | What is the difference between anodic and cathodic coatings? | |
| | (c) | Calculate higher calorific value of a coal sample containing C=85%,H=1%,N=1.5%,O=5%,S=0.4% and remaining being ash. | |
| | (d) | Write the composition, properties and uses of commercial brass. | |
| | (e) | Explain the principle "Inherently Safer Chemistry of Accident Prevention" in green chemistry. | |
| | (f) | Write the classification of composite materials. | |
| | (g) | What are functions of pigments in paints? | |

| | | | |
|---|---|---|---|
| 2 | (a) | Define corrosion. Explain the mechanism of wet corrosion with respect to neutral and alkaline media. | 6 |
| | (b)i) | 1.4 gm of coal sample on combustion gave 0.3 gm of barium sulphate precipitate. Calculate the percentage of sulphur in the sample. | 3 |
| | ii) | What are the industrial applications of super critical $CO_2$? | 2 |
| | (c) | What are large particle reinforced composite materials? Explain with the help of examples. | 4 |

| | | | |
|---|---|---|---|
| 3 | (a) | What is cracking? Explain in detail fixed bed catalytic cracking. | 6 |
| | (b)i) | What are shape memory alloys ?What are their applications ? | 3 |
| | ii) | How does the presence of humidity affect the rate of corrosion? | 2 |
| | (c) | Calculate the percentage atom economy of the following reaction with respect to the product allyl chloride | |

$$CH_3\text{-}CH=CH_2+Cl_2 \longrightarrow Cl\text{-}CH_2\text{-}CH=CH_2+HCl$$

Allyl Chloride

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4 (a) What is anodic protection method of corrosion control? Explain with the help of a neat diagram .     6

  (b)i) What are the industrial applications of the products from natural materials ?     3

   ii) What are the functions of matrix phase of composite materials?     2

  (c) Write a note on heat resisting steel.     4

5 (a) A sample of coal was found to contain C=90%,O=5%,H=1%,S=0.5% and remaining being nitrogen.Calculate weight and volume of air required for complete combustion of 1 kg of coal sample.(M.W.of air=28.949)     6

  (b)i) "The noble metals do not undergo corrosion" .Justify the statement.     3

   ii) What are the applications of fuel cell?     2

  (c) Explain with suitable equations ,conventional and green synthesis of adipic acid.     4

6 (a) What is powder metallurgy? Explain powder injection moulding method with the help of a neat diagram.     6

  (b)i) What are the characteristics of composite materials ?     3

   ii) What are the characteristics of a paint film?     2

  (c) What is biodiesel? Write the advantages of biodiesel.     4

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FE SEM-II (ALL BRANCHES) CHOICE BASED   Date : 27/05/2019

Time: 3 Hours                                   Total Marks: 80

N.B
   (1) Question no. 1 is compulsory.
   (2) Attempt any 3 from the remaining questions.
   (3) Assume suitable data if necessary.
   (4) Figures to right indicate full marks.

Q.1   a   Attempt the Multiple Choice Questions                        6
          i)#include<stdio.h>
          int main()
          {
            int a=0;
            a=a++ + a++ - a++ + ++a;
            printf("%d\n", a);
            return 0;
          }
          The output of above program is
          (a) 2          (b) 0          (c) 3          (d) Error

          ii) Which of the following operator can be used to access value at address stored in a
          pointer variable?

          (a) *          (b) @          (c) &          (d) &&

          iii)In C Programming which of the operator have the highest precedence
          (a) Relational     (b) Arithmetic     (c)Bitwise     (d) Logical

          iv) Which of the following are themselves a collection of different data types?
          (a) string     (b) 2D Arrays     (c) structures     (d) char

          v) If x and b are the float variable what is the value of  x when x=sizeof(b).
          (a) 2     (b) 3     (c) 4     (d) Null

          vi)The default value of static storage class variable is
          (a) Zero     (b) Garbage     (c) One     (d) None of above

      b)  Find the output of following                                  4
          i) ) #include <stdio.h>
          int main()
          {       int a=1;
                  do{
                        a++;
                        ++a;
                  }while(a++>25);

                  printf("%d\n",a);

                  return 0;
          }

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ii) 
```c
#include <stdio.h>
int main()
{       int x;
        x = 10;
        if(x > 10)
            x -= 10;
        else if(x >= 0)
                x += 00;
        else if(x)
                x += 10;
        else
                x -= 10;

        printf("%d\n",x);
        return 0;
}
```

c) Convert the following
   i)153 from base 10 to Hexadecimal
   ii)1100 1101 1001 1011 from base 2 to decimal
   iii) 143 from base 8 to decimal

6

d) Differentiate between Structure and Union

4

Q.2 a) What is recursion? Write a program using recursion to calculate the value of $Z=X^Y$.  8

b) Write a function to reverse a 3 digit number

6

c) Write a program to display following pattern

6

```
    0
   0 1
  0 1 0
 0 1 0 1
0 1 0 1 0
```

Q.3 a) Write a program to find the frequency of digits in a set of numbers and remove duplicates  10
from an array .For ex. array A={1,2,3,4,2,5,2} frequency of 2 is 3 and resultant array is
A={1,2,3,4,5}.

b) Explain the concept of nested structure? Declare a structure to enter employee  10
Information like name, id, salary, date of joining. Use nested structure to get the address
of an employee. Write a program to read 10 records and display them.

Q.4 a) Explain strncat() & strcpy() with example. Also write a program to check whether entered  10
string is palindrome or not without using inbuilt string functions.

b) Differentiate between call by value and call by reference. Write a program to calculate  10

Factorial of a number using call by reference.

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Q.5  a)  What is file?.Explain the functions available for Reading & Writing data of files?  10
Write a program to take student information from user and store it in file.

b)  Write a program to calculate sum of diagonal elements of a matrix.  10
For ex.
1 2 3
5 9 8
1 4 7
Calculate the sum of diagonal elements=3+9+1=13

Q.6  a)  Explain storage classes with example.  10

b)  Write a program to find greatest number among three entered number using ternary  4
operator

c)  Write a program to calculate the sum of series  6
x-x/2!+x/3!-x/4!.....x/n!

_____

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F.E. (Sem II) (All Branches) Choice Based May-2019
31/05/2019 (morning)

**Duration: 2 Hours**                                                    **Total Marks: 40**

N.B.:

1. **Question No. 1** is compulsory.
2. Attempt any **three** from the remaining **five** questions.
3. Figures to the right indicate marks.
4. Answers to all sub questions should be attempted and grouped together.

1. A) Elucidate non- verbal communication with any five types, which should be applied while attending an interview.                                                          **4M**

   B) Identify the barriers from any **two** situations and briefly state how to overcome them:   **6M**
      i)   The sales target could not be achieved despite marketing the product well in advance.
      ii)  A presentation session was not appreciated in spite of thorough preparation by the speaker.
      iii) A friend of yours is unable to keep his appointment with you. Neither is there any phone call later apologizing. You had set aside time from a very busy day and had to cancel some other work. You are upset and conclude that your friend is indifferent to commitment.

2. A) Give reasons why it is essential for engineering students to study communication skills.   **2M**

   B) For the following communication situations identify the Sender, Message, Medium, Channel, Receiver and Feedback.                                                        **6M**
      i)   A project presentation
      ii)  An advertisement campaign

   C) Draw the lay-out of Complete block format                                              **2M**

3. A) Explain any 4 principles of business correspondence (4C's)                              **3M**

   B) Change the sentences into 'You- attitude'                                               **2M**
      i)   We regret that the goods did not reach the buyers on time
      ii)  We cannot approve your refund request until we receive complete information with the required documents.

   C) As the Sales Director of Fitness Plus Centre, Mumbai, draft a sales letter to Business Professionals describing them your 3 Wellness Packages: 1. The 3- day Fitness Weekend 2. The 7-day Total Fitness Program 3. The Individualized Corporate Well-Being Program.                                                                            **5M**

4. A) Choose a useful computer program and write **five** instructions on how to use it.      **5M**

   B) One word substitutes:                                                                   **5M**
      i)   A reference work providing summaries of knowledge from either all branches or from a particular discipline. (E)
      ii)  The study of the origin and history of words  (E)
      iii) Study of the role of Time in communication (C)
      iv)  One who does election analysis (P)
      v)   Name adopted by an author in his writings (P)

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5. A) Write short notes on any **four**:
   i) Grapevine  ii) Listening  iii) Feedback  iv) Proxemics  v)  Appearance                    **8M**

   B) Match the following:                    **2M**

| A | B |
|---|---|
| Specialized Vocabulary | Warning |
| Rapid reading technique | Note |
| Instructions to avoid an injury | Jargon |
| Information for performing the task correctly | Scanning |

6 A) Re arrange the following letter making the necessary corrections in form, punctuation, language and style:                    **3M**

**Hewlett-Packard Ltd, India Chandiwala Estate, Maa Anandmayi Marg,Kalkaji, N.Delhi 110019**

Your Ref.

Our Ref.

Date:

Dear Mr. Singh

Thank you very much for your enquiry which is received today. I am enclosing our catalogue and price list for the equipment, you said you are interested in. We would welcome any further enquiries you have and look forward to hearing from you.

Yours sincerely,

D. Sampson

Sales Manager

Encl; Catalogue and price list

To

Mr. Rakesh Singh

Digital Equipment

92,Industrial Suburb,

Yeshwantpur, Bangalore 560022.

**Read the passage and answer the questions:**

In communication the 'audience' is the person or group of people whom you expect to read your information. Even though writers do not know exactly who will read their documents, they can usually define an intended audience as technical, semi technical or non- technical.

The **technical audience** includes practitioners in your field: those with technical experience and training such as technicians and engineers. Technical audience understands fundamental concepts and jargons without definitions or background information. Readers expect the writer to use technical language efficiently and appropriately.

The **semi technical audience** has some technical training or work in the industry, but not directly in the field, those working in related departments or those with training in related technical areas. This might even include Personnel in marketing, finance or administration of a technical company. The semi technical audience needs some explanation of concepts, abbreviations and jargons. Writers use technical terms only if they are common in the company or industry. For this audience you might provide an orientation to the subject and explain or interpret the terms and information.

The last type of audience is **non- technical audience includes** general public, an unknown audience or any combination of technical, non- technical and semi technical audience, including customers, clients and patients. It might also include upper management – a group which is uninvolved with technical activities, but which must have an active role in decision making for the company. This audience expects a clear organization that progresses from the background to the new information with examples or illustrations to explain points that may be confusing.

For this audience writers provide the most comprehensive treatment of the subject, such as common terminology, simple language free of jargon and technical data, a full background and orientation to the subject along with a complete discussion of the main points. To simplify difficult concepts writers often compare technical processes to more familiar ones through analogies and metaphors.

1. Define 'audience' as it applies to technical communication           **1M**
2. How does the author adapt himself/herself to technical audience?     **2M**
3. What type of people constitute non-technical audience?          **2M**
4. Why do the writers need to explain or interpret the terms for a semi technical audience?   **2M**

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72518

FE / sem - II / All Branches / choice based / 7/5/2019
Paper / Subject Code: 29706 / Engineering Drawing.

morning

(3 Hours)                                    [Total Marks: 60]

N. B. – 1. **Attempt any four questions.**
2. Use first angle method of projection, unless mentioned otherwise.
3. Write all answers on drawing sheets only & use both sides of the sheets.
4. Use your own judgment for any unspecified dimension.
5. Retain construction lines.
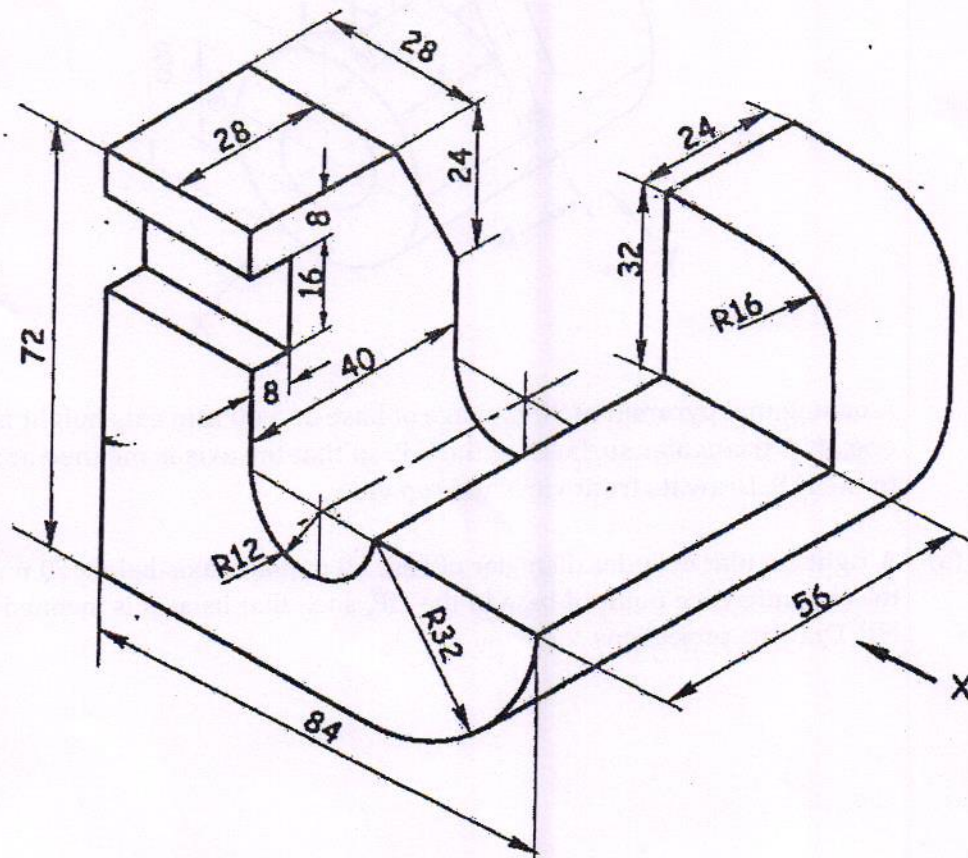6. All dimensions are in mm.

Q.1.(a)  One end of an inelastic string, 125mm long is attached to the circumference of a circular   (06)
disc of 50 mm diameter. The free end of the string is wound around the disc, keeping
the string always tight. Draw the locus of the free end and name the curve.

Q.1.(b)  For the object shown in figure draw the following views -
(i)  Front view in the direction of arrow X.
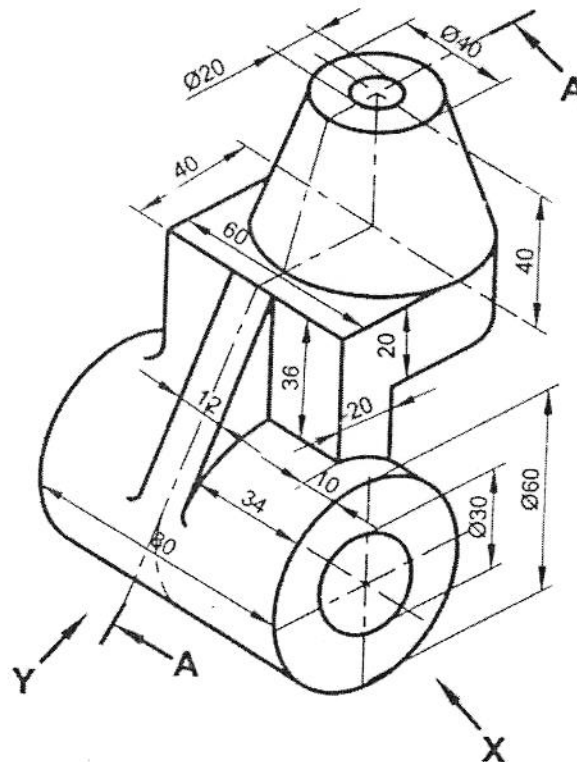(ii) Top view.                                                                        (05)
                                                                                      (04)

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Q.2     For the object shown in figure draw the following views –
        (i)   Sectional front view along section A-A.
        (ii)  Side view from left                                    (04)
        (iii) Top view                                               (04)
        (iv)  Insert the major dimensions                            (05)
                                                                     (02)



Q.3     A pentagonal pyramid of 30 mm age of base and 60 mm axis height is lying on     (15)
        one of its triangular surfaces in the V.P. so that the axis is inclined at angle of 45⁰
        to the H.P. Draw its front view and top view.

Q.4 (a) A right circular cylinder diameter of base 50 mm and axis height 70 mm has one of    (06)
        the circumference point of base in the HP, such that its axis is inclined at 30⁰ to the
        HP. Draw its projections.

**72902**                        **Page 2 of 3**

Q.4 (b)  Figure shows two views of an object. Draw its isometric view.

(09)
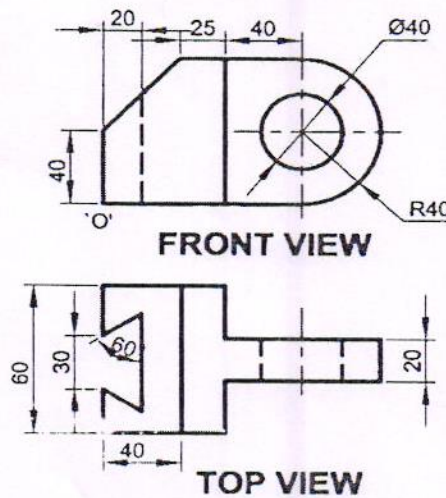


**FRONT VIEW**

**TOP VIEW**

Q.5.  A cone of base 70 mm diameter and axis 90 mm long is resting on its base on HP. It  (15)
is cut by a section plane perpendicular to the VP and parallel to and 15 mm away
from one of its end generators. Draw the sectional top view, front view & sectional
side view. Also draw the true shape of the section. Also draw development of the
lateral surface of the cone.

Q.6 (a)  The T.V. of line AB measures 60 mm and is inclined at $56^0$ to the XY line. Point A  (09)
is 10 mm above the H.P. and 20 mm in front of the V.P. Point B is 45mm above
H.P. and in front of the V.P. Draw the projection of line AB.

Q.6 (b)  Figure shows two views of an object. Draw its isometric view with 'O' as origin.

(06)



FV

LHSV