

Seat No.	
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First Year (All Branches) (Semester- I & II) (New)

(Revised) Examination, May - 2017

BASIC CIVIL ENGINEERING

Sub. Code : 59179

Day and Date : Tuesday, 09-05-2017

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Make suitable assumptions wherever Necessary and mention it clearly.
 - 4) Use of non-programmable calculator is allowed.

SECTION-I

- Q1) a)** State the various principles of planning and explain any two with neat sketch. [8]
- b)** Write short note on 'scope of civil engineering'. [4]

OR

- b)** Write a short note on 'Role of a civil engineer'. [4]
- c)** What are the various building Bye-laws? [4]

Q2) Answer the following.

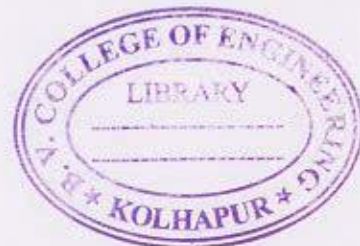
- a) Explain with a neat sketch the different elements of super-structure of building. Mention their functions. [6]
- b) Explain the various types of soil and rocks as foundation strata. [6]
- c) What are the various types of foundations? Explain the basis on which you will select each type of foundation for a particular situation. [6]

Q3) a) Compare merits and demerits of timber and steel as a building material. [8]

OR

- a) What are different grades of concrete? Write note on P.C.C, R.C.C. and R.M.C. [8]
- b) What are the various advantages and uses of building bricks. [4]
- c) How will you classify the various loads coming on a structure. [4]

P.T.O.



SECTION-II

- Q4) a) Write note on principles of surveying. [4]
- b) Differentiate between whole circle bearings and reduced bearings system. [4]
- c) A 30 m chain was found to be 15.24 cm too long after chaining a distance of 1524 m. The chain was found 30.48 cm too long after chaining a total distance 3048 m. The chain was correct before commencement of the work, find the true distance. [8]

OR

- c) The following bearings were taken with a prismatic compass in running a closed traverse. [8]

Line	AB	BC	CD	DE	EA
F.B.	50° 00'	157°30'	243°30'	311°00'	30°00'
B.B.	231°30'	335°30'	65°00'	130°00'	210°00'

- Plot the traverse and show all F.B. and B.B. on it.
 - Calculate correct F.B. and B.B.
 - Find out the amount of local attraction at affected stations.
 - Calculate included angles. Show specimen calculations.
- Q5) a) Attempt any two questions from the following.
- Write a note on 'Auto level' [4]
 - How you will calculate area on paper using mechanical planimeter? [4]
 - State and explain methods of reduction of levels. [4]
- b) The following consecutive readings were taken with a dumpy level and a 4.0 m leveling staff on a continuously sloping ground at a common interval of 20 m.
- 0.540, 1.245, 2.375, 3.885, 1.245, 2.560, 3.780, 0.875, 1.625, 2.960
- The R.L. of first station was 350.000 m. Make entries in the level book page and apply usual check. Determine gradient of line joining first and last stations. Use rise and fall method. Show sample calculations. [10]

- Q6) a) Explain with neat diagram functions of various components of railway track (Broad gauge). [4]
- b) Explain with neat diagram components of flexible pavement. [4]
- c) Explain with neat diagram various units of water treatment plant. [4]
- d) Explain with neat diagram gravity dam. [4]

OR

- d) Explain components of earthen dam with neat diagram. [4]



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Total No. of Pages :2

Seat No.	
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F.E. (All Branches) (Part - I) (Semester - I & II) (Revised)
Examination, November - 2017
FUNDAMENTALS OF ELECTRONICS AND COMPUTERS
Sub. Code: 59184

Day and Date :Saturday, 11 - 11 - 2017

Total Marks : 100

Time :2.30 p.m. to 5.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to right indicate full marks.
 - 3) Assume suitable data if necessary.

SECTION - I

Q1) Solve any two : [18]

- a) Explain HW rectifier with necessary waveforms.
- b) What is flip-flop? Explain J-K flip-flop.
- c) Write a short note on mobile handset with block diagram.

Q2) Solve any two : [16]

- a) Explain how transistor operates in CB configuration? Explain with I/P and O/P characteristics.
- b) What is De-multiplexer? Explain 1 :4De-mux with truth table.
- c) Explain washing machine with block diagram.

Q3) Solve any two : [16]

- a) Explain fixed bias circuit for biasing of transistor. Derive expression for stability factor.
- b) Mention names of logic families and explain any one in detail.
- c) Explain in details thermistor transducer with an application.

P.T.O.

SECTION - II**Q4) Solve any two :****[18]**

- a) What are different hardware component of a computer system. Explain any four of them.
- b) What is operating system? Explain different types of OS.
- c) Write short note on computer network.

Q5) Solve any two :**[16]**

- a) List and explain different topologies of computer network.
- b) Explain output devices of computer system.
- c) Explain following UNIX/LINUX command with an example.
 - i) LS.
 - ii) CD.
 - iii) CAT.
 - iv) MKDIR.
 - v) PWD.
 - vi) CP.

Q6) Solve any two :**[16]**

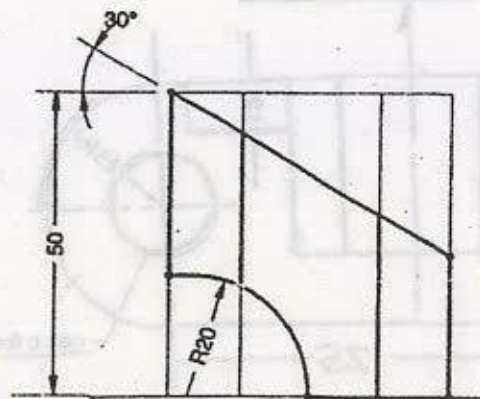
- a) Explain OSI model.
- b) Explain in brief Assembler, interpreter and compiler.
- c) Explain low level language and high level language in details.



Q6) Solve any one.

a) Solve.

- i) A right circular cone of base dia. 50mm & axis 70mm stands on HP. It is cut by AVP which makes an angle 60° to VP & 8mm away from axis. Draw SFV, TV & true shape of section. [7]
- ii) Figure shows FV of hexagonal prism with two cutting planes. Complete the development of lateral surfaces of prism. [6]



OR

b) Solve.

A pentagonal base pyramid with base side 25mm & height 50mm is resting on HP. With one of its base edge perpendicular to VP. It is cut by section plane 45° to HP & passing through its RHS corner. Draw FV, sectional TV, and true shape of section also development of remaining part of pyramid. [13]



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F. E. (All Branches) (Part - I) (Semester - I & II) (Revised)

Examination, November - 2017

ENGINEERING GRAPHICS

Sub. Code : 59180

Day and Date : Wednesday, 22 - 11 - 2017

Total Marks : 100

Time : 02.30 p.m. to 06.30 p.m.

- Instructions :
- 1) Assume suitable data if necessary.
 - 2) Use both sides of drawing paper.
 - 3) All dimensions are in mm.
 - 4) All questions are compulsory.

SECTION - I

Q1) Solve any two : [12]

- a) Construct hyperbola having focus 70 mm away from directrix and eccentricity $4/3$. Also draw a tangent & normal at any point P on curve.
- b) To construct an Archimedean spiral of two revolutions, given the greatest & shortest radius is 100mm & 10mm resp.
- c) A circle of 50mm diameter rolls on horizontal line for half revolution clockwise and then on a vertical line for another half revolution. Draw the curve traced out by a point 'P' on base of circumference of circle.

Q2) a) Solve any three. [12]

- i) Complete the projections of line AB having its TL is 60mm, bearing of S60E & FV makes an angle 30° to HP. (Ref. Fig. 1 (i))
- ii) Find angle between line AB & CD. (Ref. Fig. 1 (ii))
- iii) Line AB is parallel to line CD having true length 50 mm. Complete the projections of line CD. (Ref. Fig. 1 (iii))
- iv) Find angle made by plane PQR with HP and VP (Ref. Fig. 1 (iv))

SF - 8

b) Solve.

[13]

A triangular Plate ABC, AB = 60 mm, BC=45 mm and AC=30mm has its longest side in VP and inclined at 30° to HP. Draw its projections if its surface is inclined at 45° to the VP.

Q3) Solve.

[13]

A right circular cylinder with 50mm dia. & height 70mm rest on Hp. Such that the base is inclined at 60° to HP & its axis is inclined 45° to VP. Complete projections of cylinder.

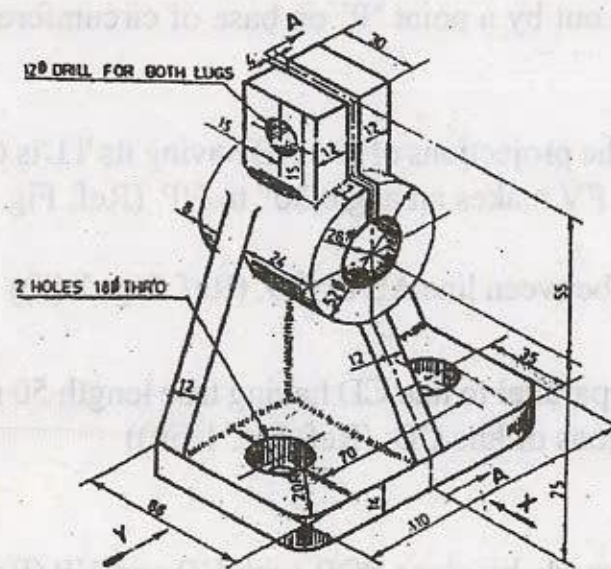
SECTION -II

Q4) Solve.

[24]

The following figure shows a bracket. Draw the following views:

- FV from X direction
- TV&
- Sectional LHSV along section AA.

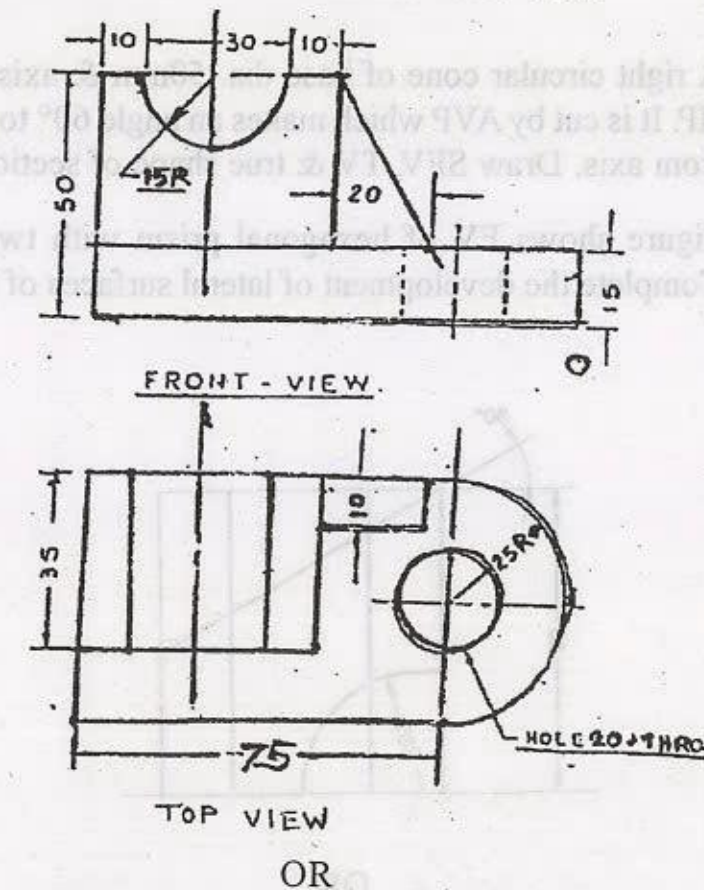


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[13]

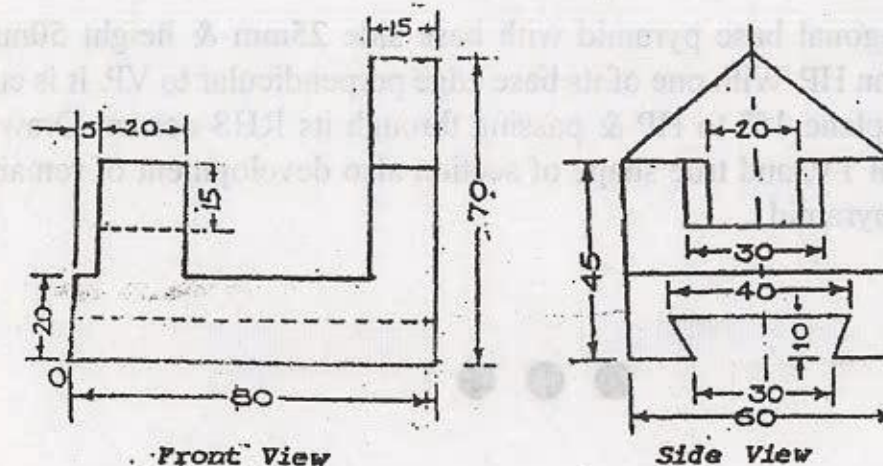
Q5) Solve any one.

- Figure shows the views. Draw its isometric view.



- Figure shows the views. Draw its isometric view.

[13]



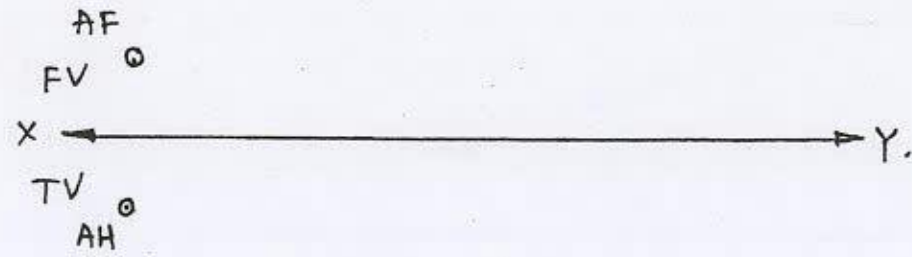


Fig 1 (i)

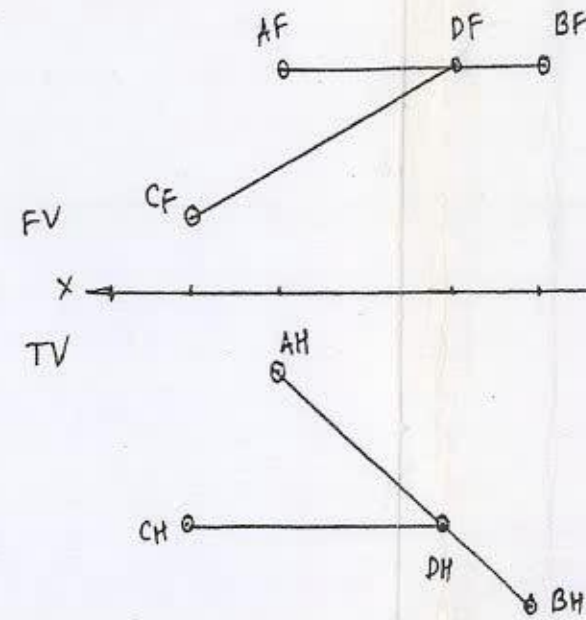


Fig 1 (ii)

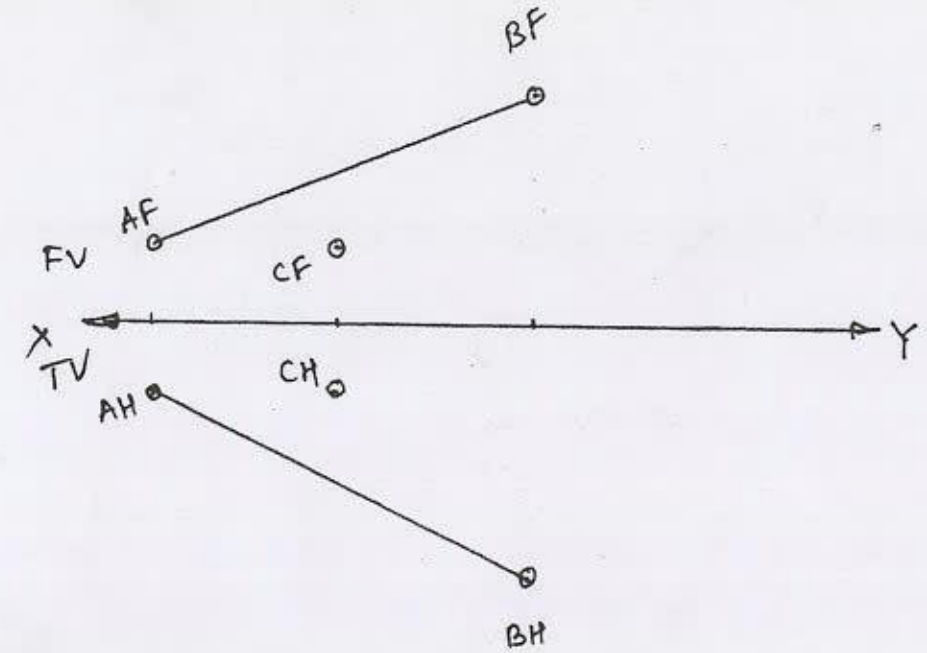


Fig 1 (iii)

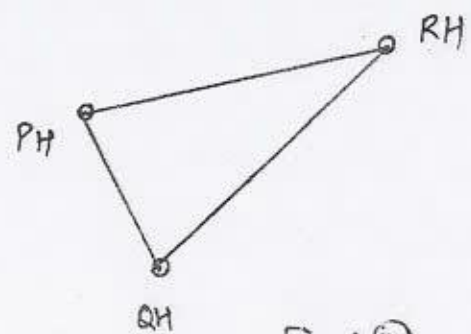
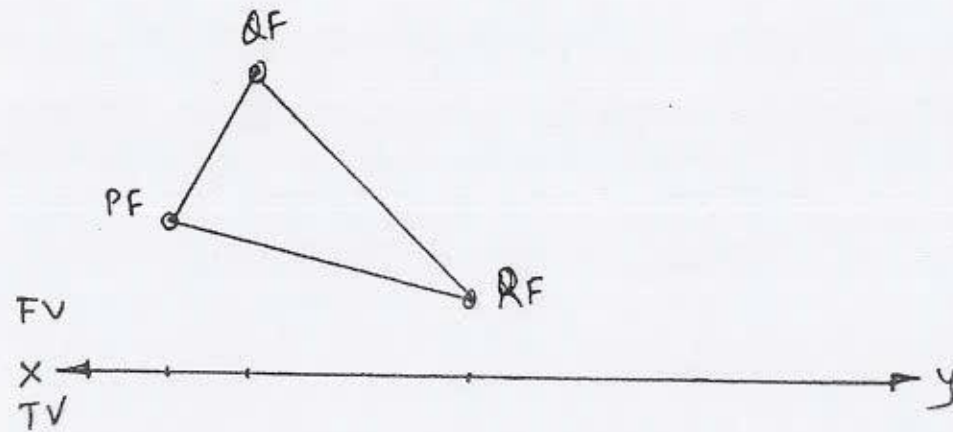


Fig 1 (iv)

Q.No.	1	2	3	4	5	6	Signature of the Examiner
Marks							
Sr. No.							Signature of Jr. Supervisor
Examination : _____ Paper No. _____							Section _____
Subject							Code No.
SHIVAJI UNIVERSITY, KOLHAPUR							
Name of Exam : _____							Code No.
Paper No. _____							Section _____
Seat No. _____							Centre _____

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Total No. of Pages : 3

Seat No.	
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First Year Engineering (All Branches) (Semester - II) (New)

Examination, November - 2017

BASIC CIVIL ENGINEERING

Sub. Code :59179

Day and Date : Tuesday, 14- 11 - 2017

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Make suitable assumptions wherever necessary and mention it clearly.
 - 4) Use of non-programmable calculator is allowed.

SECTION - I

Q1) a) Explain significance of branches of Civil Engineering. [8]

OR

- a) Enlist various principles of building planning. Explain Privacy, Sanitation in detail. [8]
- b) Write short note on orientation of building. [4]
- c) Write down the specific Bye Laws for, [4]
 - i) Open space requirement
 - ii) FSI

Q2) Answer the following. [18]

- a) Differentiate between:
 - i) Uniform and differential settlement
 - ii) Shallow and Deep foundation
- b) Explain with neat sketch functions of different elements of substructure and superstructure.
- c) What is deep foundation? Explain pile foundation with neat sketch.

P.T.O.

SF-6

i) a) Write short note on

- i) Different roofing materials.
- ii) Types of cement with their properties.

OR

a) Differentiate between

- i) load bearing and framed structures.
- ii) RCC steel and structural steel

b) What are the characteristics of good brick?

c) Write uses of plastic as a Building material.

SECTION - II

14) a) Classify surveying on the basis of instruments used? Explain the principles on which surveying works.

b) State & Explain in detail Principle of Optical Square.

c) The distance between two villages was measured with a 20 m chain and was found to be 2719 m. The same distance was measured with 30 m chain and was found to be 13,600 links. The test shows that both chains were incorrect. What correction is required in the 20 m chain, if the 30 m chain is 0.5 links too long?

OR

Observed bearings for a closed compass traverse are given below. Find the local attraction at each end of the affected station and correct all bearings. Tabulate the data and results. Find also included angles. Show all calculations.

Line	PQ	QR	RS	ST	TP
F.B	N 48° W	N 9° E	S 83° E	S 15° E	S 64° W
B.B	S 50° E	S 7° W	N 80° W	N 15° W	N 65° E

SF-6

5) a) Attempt any Two questions from following

- i) How planimeter is used for measuring areas of irregular figures? [4]
- ii) Differentiate between Rise & fall method and collimation plane method. [4]

iii) Explain characteristics of contours with neat sketch. [4]

b) The following staff readings were observed on a continuously sloping ground with the help of a dumpy level and 4m staff at 30 m interval. The last reading was taken on B.M. of RL 240.120 m.

0.420, 1.660, 2.880, 0.580, 1.385, 2.270, 2.995, 3.800, 0.625, 2.365, 3.225, 3.630.

Enter the readings in a page of level book. Find R.L.s by Rise and Fall method. Apply usual checks. Determine longitudinal gradient. [10]

16) a) Differentiate between rigid and flexible pavement. [4]

b) Explain the components of railway track (Broad gauge). [4]

c) State the types of dams. Explain gravity dam with neat sketch. [4]

d) Explain with neat diagram functions of units in water treatment plant. [4]



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F.E. (All Branches) (Semester - I & II) (Revised)

Examination, November - 2017

BASIC ELECTRICAL ENGINEERING

Sub. Code : 59178

Day and Date : Thursday, 09-11-2017

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

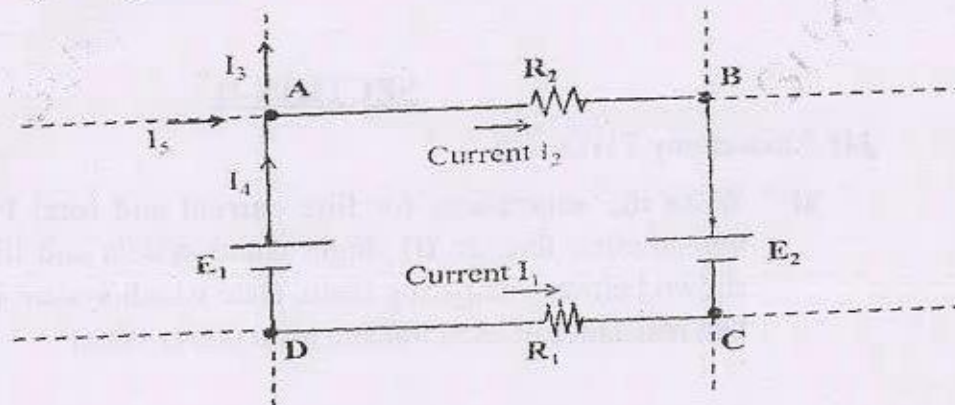
- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Draw neat labeled diagrams as a part of explanation.
 - 4) In case of any missing data, assume suitable value. State it clearly.

SECTION-I

Q1) Answer any TWO:

[2×9=18]

- a) State Kirchhoff's laws. Write KCL and KVL equations for node A and loop ABCDA in following circuit. Explain the sign rules used while writing your equations.



- b) Derive an expression for Magneto motive force of a series magnetic circuit having three different magnetic materials. Draw equivalent electrical circuit and equivalent expression for the same.
- c) An electric toaster has rating 1000 W, 240V. Find its resistance. The toaster is connected to 220V supply instead of the rated voltage. Now calculate current & power taken at 220V. If toaster works for 5 minutes, Calculate the cost of energy at Rs. 4/KWh.

P.T.O.

SF-4

Q2) Answer any TWO:

[2×9=18]

- Derive the mathematical expression for average value of sinusoidal AC by analytical method. Mention one application where average value of AC is important.
- Define power factor in AC system. State causes and drawbacks of low power factor.
- If a single phase series A.C. circuit has applied voltage $v = 100 \sin(\omega t + 20^\circ)$ volt and current $i = 15 \sin(\omega t + 60^\circ)$ ampere

Determine - Impedance, phase difference, power factor, Resistance, Reactance, Power.

Q3) Answer any TWO:

[2×7=14]

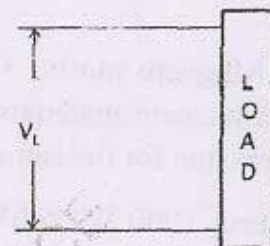
- Draw and explain working of single phase induction type energy meter.
- State the importance of earthing in electrical installation. Explain with neat sketch any one earthing method.
- Draw circuit diagram and explain the operation of fluorescent tube working on sinusoidal AC voltage. State its advantages as compared to incandescent bulb.

SECTION-II

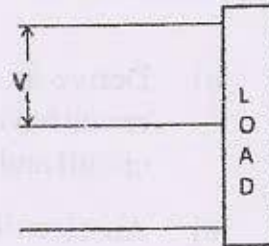
Q4) Answer any TWO:

[2×7=14]

- Write the expression for line current and total I^2R power loss in transmission lines in (i) single phase system and (ii) 3 phase system shown below. Comparing them, state which system is better. (Assume that resistance of each transmission line is same)



Load takes power P
Pf of load = $\cos \Phi$



Load takes power P
Pf of load = $\cos \Phi$

SF-4

- Draw circuit diagram for (i) star connected circuit (ii) delta connected circuit. Show line voltage, phase voltage, line current, phase current on each diagram. For each circuit, write the relation between (1) line voltage and phase voltage (2) line current and phase current.
- Define and explain
 - balanced 3 phase supply
 - phase sequence
 - balanced 3 phase load

Q5) Answer any TWO:

[2×9=18]

- List the advantages of rotating field alternator as compared to rotating armature alternator. Why slip rings-brushes are required in an alternator?
- Explain the working of transformer with load. Draw suitable diagrams.
- Two windings of a transformer have 1000 turns and 500 turns. It is used as a step up transformer with 200 V ac supply and 0.8 pf load. The load current is 5A. Find (i) secondary voltage (ii) primary current (iii) the copper loss at this load, (iv) efficiency of transformer at this load,. Given: Iron loss of the transformer = 30W, Copper loss of the transformer at 1A load current is 3W.

Q6) Answer any TWO:

[2×9=18]

- State important features of universal motor. What are the disadvantages due to commutator?
- List the differences between split phase induction motor and shaded pole induction motor? With reasons state which of the above motors is preferred for (i) compressor (ii) sound recording instrument.
- Explain the working of split phase induction motor. Draw suitable diagrams.



SF-9
[15]

16) Attempt any three of the following.

- Solve the following equations by Gauss-Jordan method
 $x + y + z = 5; 2x + 3y + z = 10; 3x - 2y + 2z = 3.$
- Use Jacobi's iteration method (Three iterations only) to solve
 $5x + 2y + z = 12; x + 4y + 2z = 15; x + 2y + 5z = 20.$
- Use Gauss-Seidal method (03 iterations) to solve the equations
 $x + 7y - 3z = (-22); 5x - 2y + 3z = 18; 2x - y + 6z = 22.$

- Find the largest eigen value of matrix $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ by Rayleigh's power

method with $x = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ as a base vector.



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Total No. of Pages : 4

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F.E. (All Branches) (Part-I) (Semester-I & II) (Revised)
Examination, November - 2017
ENGINEERING MATHEMATICS-I
Sub. Code : 59177

Day and Date : Monday, 27-11-2017
Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 100

- Instructions :
- All the questions are compulsory.
 - Figures to the right indicate full marks.
 - Use of non-programmable calculator is allowed.

SECTION-I

1) Attempt any three of the following.

[15]

- Find non-singular matrices P and Q such that PAQ is in the normal form and hence find rank of A where $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$.
- Discuss the consistency of the following system of equations and if possible solve them $2x - y - z = 2, x + 2y + z = 2, 4x - 7y - 5z = 2.$
- Use matrix method to determine the value of λ for which the equations $x + 2y + z = 3, x + y + z = \lambda, 3x + y + 3z = \lambda^2$ are consistent and solve them for any one value of $\lambda.$
- Solve $2x - y + 3z = 0, 3x + 2y + z = 0, x - 4y + 5z = 0,$ by matrix method.

Q2) Attempt any three of the following.

[15]

- Examine for linear dependence of vectors $(1, 2, -1, 0), (1, 3, 1, 2), (4, 2, 1, 0), (6, 1, 0, 1)$ and find a relation between them if dependent.

P.T.O.

- b) Determine the Eigen values and Eigen vector corresponding to greatest

Eigen value only, for $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$.

- c) Find the Eigen values of matrix $A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$. Hence find Eigen values for A^4 , A^{-1} , $5A$ by using properties of eigen values.

- d) Verify Cayley Hamilton theorem for $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$.

Q3) Attempt any four of the following.

[20]

a) Simplify $\frac{(\cos 5\theta - i \sin 5\theta)^2 (\cos 7\theta + i \sin 7\theta)^{-3}}{(\cos 4\theta - i \sin 4\theta)^9 (\cos \theta + i \sin \theta)^5}$.

b) Find all the values of $\left(\frac{1}{2} + i\frac{\sqrt{3}}{2}\right)^{1/4}$.

c) Prove that $\tanh^{-1} x = \frac{1}{2} \log \left(\frac{1+x}{1-x} \right)$.

d) Express $\frac{\sin 7\theta}{\sin \theta}$ in powers of $\sin \theta$ only.

e) Prove that $\left(\frac{\cosh x + \sinh x}{\cosh x - \sinh x} \right)^n = \cosh 2nx + \sinh 2nx$.

f) Express $\cos^{-1} \left(\frac{3i}{4} \right)$ in the form $(a + ib)$.

SECTION-II

Q4) Attempt any three of the following.

[15]

a) Expand $e^{x \cos x}$ in powers of x upto x^4 term.

b) Use Maclaurin's series to expand function $\tan \left(\frac{\pi}{4} + x \right)$ in a ascending power of x .

c) Use Taylor's series to find $(\sqrt{25.15})$ correct upto four decimal places.

d) Evaluate $\lim_{x \rightarrow 1} \left[\frac{x - x^x}{1 + \log x - x} \right]$.

Q5) Attempt any four of the following.

[20]

a) If $u = \log(x^3 + y^3 - x^2y - xy^2)$ then prove that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} \right)^2 u = \frac{-4}{(x+y)^2}$.

b) If $u = \frac{1}{2} \log(y^2 - x^2)$ then find the value of $\left(x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} \right)$.

c) If $u = xyz$; $v = x^2 + y^2 + z^2$; $w = (x+y+z)$ then find $J \left(\frac{u, v, w}{x, y, z} \right)$.

d) Find the minimum and maximum values of $(x^3 + 3xy^2 - 3x^2 - 3y^2 + 4)$.

e) If power P is given by $P = \left(\frac{E^2}{R} \right)$. Find the approximate percentage error in power P if E is increased by 3% and R is decreased by 2%.

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Total No. of Pages : 3

Seat No.	
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EE. (All Branches) (Semester - I & II) (New)
Examination, November - 2017
ENGINEERING PHYSICS
Sub. Code: 59176

Day and Date : Friday, 03 - 11 - 2017
Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 100

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Given:-
Avogadro's number = 6.02×10^{26} /kg.atom
Planck's constant $h = 6.63 \times 10^{-34}$ J.s
Electronic charge $e = 1.6 \times 10^{-19}$ C
Electron mass $m = 9.1 \times 10^{-31}$ kg

SECTION - I

Q1) Attempt Any Three from the following questions.

- a) What is grating? Give theory of plane transmission grating for normal incidence. [6]
- b) Explain construction and working of Laurent's half shade polarimeter. [6]
- c) i) What is double refraction? [3]
ii) A tube of sugar solution 20 cm long is placed between crossed Nicols and illuminated with a monochromatic light. If the optical rotation produced is 13° and specific rotation is $65^\circ \text{dm/g/cm}^3$, determine the concentration of the solution. [2]
- d) A grating has 6000 lines per cm on it. Its width is 10cm, calculate
i) the resolving power in the second order and
ii) the smallest wavelength that can be resolved in the third order in 6000 \AA wavelength. [5]

P.T.O.

SF - 2

Q2) Attempt Any Three from the following questions.

- With neat diagram explain construction and working of ruby laser. [6]
- Discuss industrial and medical applications of laser. [6]
- Explain the advantages of optical fiber. [5]
- With suitable diagram explain the terms : acceptance angle, acceptance cone and Numerical aperture of an optical fiber. [5]

Q3) Attempt Any Three of the following questions.

- What is nuclear reactor? Explain various features used in the classification of a Nuclear reactor. [6]
- Calculate the power output of a nuclear reactor which consumes 50gm of U^{235} Per day. Assume 5% reactor efficiency. Given: Energy released per fission of U^{235} is 200MeV. [5]
- What do you mean by thermonuclear reactions? Give proton-proton chain reaction. [5]
- Write note on fusion power reactor. [5]

SECTION - II

Q4) Attempt Any Three from the following questions.

- Find the number of atoms per unit cell, the coordination number and the atomic radius of BCC lattice. [6]
- What are Miller Indices? How are they determined?
Draw the planes in cube (111) and (110) [6]
- Explain the terms unit cell and their types. [5]
- Explain the centre of symmetry. [2]
 - A beam of X-rays of wavelength 0.71 \AA is diffracted by (110) plane of rock salt with lattice constant of 2.8 \AA . Find the glancing angle for the second order diffraction. [3]

SF - 2

Q5) Attempt Any Three from the following questions.

- Discuss de-Broglie's concept of matter waves. Find an expression for the de-Broglie wavelength associated with a particle accelerated through a potential difference 'V' volts. [6]
- What is Compton Effect? Explain experimental arrangement used to study Compton Effect. Write the formula for Compton Shift. [6]
- State and explain Heisenberg's uncertainty principle. [5]
- State properties of matter wave. [2]
 - Determine the velocity and kinetic energy of a neutron having de-Broglie wavelength 1.0 \AA . Mass of neutron is $1.67 \times 10^{-27} \text{ kg}$. [3]

Q6) Attempt Any Three from the following questions.

- With neat diagram explain construction and working of Atomic Force Microscope. [6]
- Explain the electrical, magnetic and mechanical properties of nanomaterials. [5]
- What are different types of the CNT? Explain any two properties of CNT in detail. [5]
- Explain the ball milling method for getting nano particles. [5]



Seat No.	
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F.E. (All Branches) (Semester- I & II) (Revised)
Examination, November - 2017
ENGINEERING CHEMISTRY
Sub. Code : 59183

Day and Date : Tuesday, 07-11-2017

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Assume suitable data wherever necessary.
 - 3) Draw neat labeled diagram wherever necessary.
 - 4) Figures to the right indicate full marks.

SECTION-I

Q1) a) A sample of water on analysis was found to contain the following salts:[8]

Salt	Salt mass in mg/lit.	Mol. Wt.
$\text{Ca}(\text{HCO}_3)_2$	26.2	162
$\text{Mg}(\text{HCO}_3)_2$	21.9	146
CaCl_2	23.0	111
MgSO_4	36.0	120
NaCl	28.5	58.5

Calculate temporary, permanent and total hardness of sample in degree French.

- b)** Solve any two questions: [10]
- i) What are the advantages and disadvantages of instrumental methods of analysis?
 - ii) Explain properties and applications of ERP.
 - iii) Explain reverse osmosis process for purification of water.

Q2) a) Explain the principle, construction and working of glass electrode. [6]

- b)** Solve any TWO of the following: [10]
- i) What is scale and sludge formation? Explain mechanism of scale formation.
 - ii) Give preparation, properties and applications of Bakelite.
 - iii) What are composite materials? Explain the characteristics of composite materials.

P.T.O.

SF-3**[16]****13) Solve any four of the following:**

- Write the applications of gas chromatography.
- What is Dissolved Oxygen of water? Explain in detail.
- State and derive an equation for Lambert's law.
- Explain any four applications of nanomaterials.
- Explain the addition and condensation polymerization reaction with suitable example.
- Write note on acidity of water.

SECTION-II

14) a) Solid fuel weighing 1.097gm and containing C = 90.7%, H = 6.7% and ash = 2.6%. Have the following results in the Bomb calorimeter experiment:

Water equivalent of calorimeter = 1230gm, Amount of water taken = 3376gm,

Initial temp. of water = 27.6°C, Correction due to acids = 68.7 cal.,

Cooling correction = 0.066 °C, Final temp. of water = 33.9°C,

Correction due to fuse wire = 9.0cal.

Calculate the gross and net calorific values of the solid fuel in Joule.[8]

b) Attempt any two questions:

[10]

- What is corrosion? Explain chemical corrosion with suitable diagram.
- How will you determine calorific value of liquid fuel?
- What is an alloy? Explain the purposes of alloying with suitable example.

15) a) What are non ferrous alloys? Explain the nickel alloy giving their composition, properties and uses. **[6]**

b) Solve any two of the following:

[10]

- Compare of liquid fuel between gaseous fuels.
- Describe hydrogen evolution mechanism in wet corrosion with suitable diagram and reactions.
- Explain the factors influencing on the rate of corrosion.

SF-3**[16]****16) Answer of the following four questions:**

- Explain in detail any four characteristic of a good fuel.
- Discuss the importance of design in controlling corrosion.
- Explain any four applications of Fuel Cells in various fields.
- State composition, properties and uses of Duralumin.
- Explain process of electroplating for prevention of corrosion.
- Write short note on green chemistry.

→ → →

SF - 7

- b) A 2000N block is in contact with level plane; coefficient of friction is 0.30, if the block is acted upon horizontal force 650 N. What time elapse before the block reaches a velocity of 10 m/s starting from rest? If 650 N force is then removed how much longer will the block continue to move solve by using impulse-momentum principle. [12]

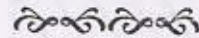
26) a) Explain motion under gravity. [3]

b) Explain coefficient of restitution. [3]

c) A ball dropped from height of 2 m on a smooth floor. The height of the first bounce is 1.62m. Determine

i) coefficient of restitution and

ii) expected height of next bounce. [10]



SF - 7

Total No. of Pages :4

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F.E. (All Branches) (Semester - I & II) (New)

Examination, November - 2017

APPLIED MECHANICS

Sub. Code: 59185

Day and Date : Monday, 20 - 11 - 2017

Total Marks : 100

Time : 2.30 p.m. to 5.30 p.m.

- Instructions :
- 1) All the questions are compulsory.
 - 2) Figures to the right indicate maximum marks for the question.
 - 3) Neat sketches should be drawn whenever necessary.
 - 4) Use of Non-Programmable calculator is allowed.
 - 5) Any missing data may be assumed suitably and clearly highlighted in the answer sheet.

SECTION-I

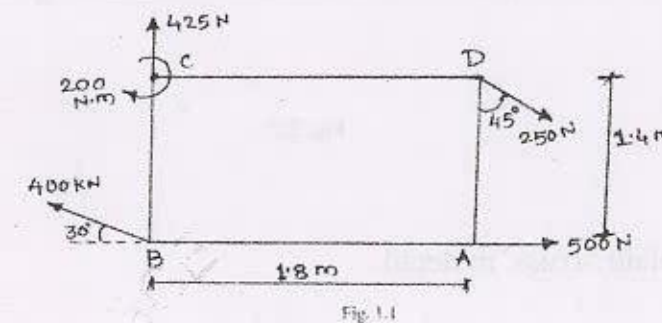
Q1) a) Explain:-

i) Resolution of forces

ii) Couple

[4]

b) Find resultant for the force system shown in figure and locate it with respect to 'A' [12]



P.T.O.

SF - 7

Q2) a) State and explain virtual work principle. [5]

b) The cylindrical rollers of weight 50 N each are placed inside a cup. Find the reactions at the point of contact. Refer fig. 2.1 [13]

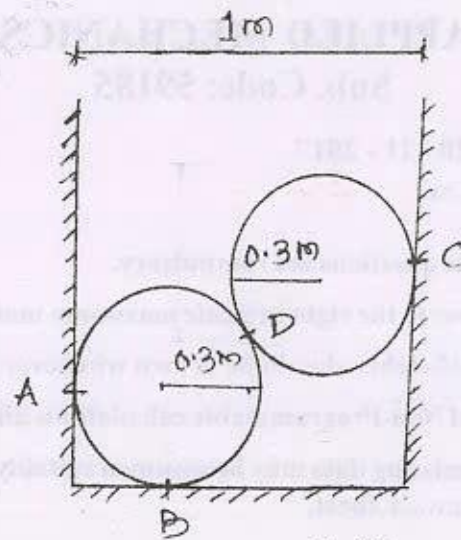


Fig. 2.1

OR

b) Determine the support reaction for the beam shown in fig. 2.2 by using Virtual work principle. [13]

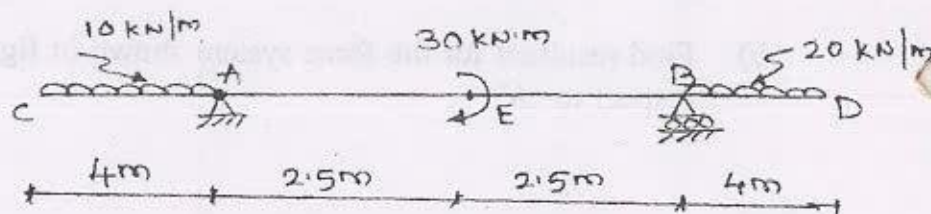
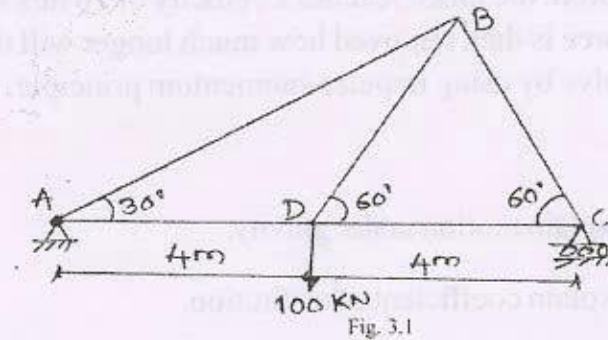


Fig. 2.2

Q3) a) Explain 'Truss' in detail. [4]

SF - 7

b) Determine the forces in all the members of a truss shown in fig. 3.1. [12]

**SECTION-II**

Q4) a) State and prove parallel axis theorem. [4]

b) Find the moment of inertia for the shaded area about centroidal both mutually perpendicular axes. Refer fig 4.1. [12]

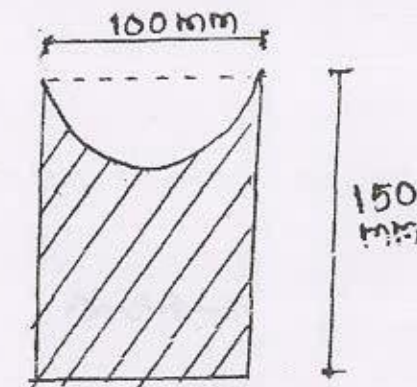


Fig. 4.1

Q5) a) Explain S-t, V-t and a-t curves. [6]

b) An elevator cage of mine shaft weighing 15 kN when empty is lifted or lowered by means of wire rope. Once man weighing 900 N entered in it and moving down with uniform acceleration such that when distance of 250 m was covered. The velocity of the cage 30 m/s. Determine the tension in the rope and force exerted by the man on the floor of the cage. [12]

OR