MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: **II (New)**	**Term**	: **II**	**Academic Year**	: **2016-17**
Course No.	: AG 124	**Title**	: **Soil Science**		
Credits	: 2 (1+1)				
Day & Date	: Wednesday, 03.05.2017	**Time**	: 09.00 to 11.00	**Total Marks**	: **40**

Note :
1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 Define rocks. Give detailed classification of rocks with one example of each.

Q.2 Enlist different soil physical properties and give importance of soil structure in plant growth.

Q.3 Define soil texture and explain soil textural classes.

Q.4 Enlist the criteria for deciding the suitability of irrigation water and classify the irrigation water on the basis of RSC.

Q.5 What are the salt affected soils? Explain the main characteristics of salt affected soils.

Q.6 What are the soil colloids? Explain any four properties of soil colloids.

Q.7 Explain the physical classification of soil water and write down the importance of soil water in agriculture.

Q.8 Discuss in brief the soils of Maharashtra.

Q.9 What is the criteria of essentiality of plant nutrient and enlist the essential plant nutrients?

Q.10 Define fertilizers and classify inorganic fertilizers.

SECTION "B"

Q.11 Define the following terms.

1) pH
2) Particle Density
3) Humification
4) Soil Consistence

Q.12 Fill in the blanks.

1) The climate is _____ soil forming factor.
2) A mineral that forms an original component of rock is called_____.
3) Humus is a _____ color high molecular weight compound.
4) The father of soil science is _____.

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
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B.Tech. (Agril. Engg.)

Semester	: **II (New)**	**Term**	: **II**	**Academic Year**	: **2016-17**
Course No.	: EOES 122	**Title**	: **Applied Electronics and Instrumentation**		
Credits	: 3 (2+1)				
Day & Date	: Saturday, 06.05.2017	**Time**	: 09.00 to 12.00	**Total Marks**	: **80**

Note :
1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 Discuss about equivalent circuits of crystal diode along with each model and characteristics.

Q.2 What are the properties of pn junction? Explain effect of applying voltage across it.

Q.3 How do diode clippers work?

Q.4 Explain in detail CE transistor amplifier.

Q.5 What is faithful amplification? Justify basic requirements for it.

Q.6 What is operational amplifier? Mention its properties and schematic presentation.

Q.7 State and explain types of voltage regulator.

Q.8 Explain the methods of statistical analysis of measured data.

Q.9 Give detailed information of any two electrical temperature transducers.

Q.10 Discuss capacitive pressure transducers with all details.

SECTION "B"

Q.11 Answer in one sentence.

1) Give long form of LVDT.
2) Mention name of suitable transducer for displacement measurement.
3) Enlist name of electric force transducer.
4) Give types of systematic errors.
5) Name the types of filters used with rectifier.
6) How much current flows through pn junction during reverse bias?
7) Give names of transistor terminals.
8) Give name of universal logic gate.

Q.12 Define the following.

1) Lag
2) Resolution
3) Knee voltage
4) Gauge factor
5) Sensitivity
6) Stabilization
7) Logic gate
8) Faithful amplification

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: **II (New)**	**Term**	: **II**	**Academic Year**	: **2016-17**
Course No.	: SWCE 121	**Title**	: **Surveying and Leveling**		
Credits	: 3 (1+2)				
Day & Date	: Friday, 05.05.2017	**Time**	: 09.00 to 11.00	**Total Marks**	: **40**

Note : 1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 What do you mean by triangulation survey? Also write the suitability of chain triangulation.

Q.2 An Engineer's chain was found to be 7.5 cm too long after chaining 120 m. It was found to be 15 cm too long at the end of the day's work, after chaining a total distance of 210 m. If the chain was correct before the commencement of chaining. Find the true distance.

Q.3 The following perpendicular offsets were taken at 3 m intervals from a chain line to a curved boundary: 2.16, 1.53, 1.80, 1.98, 1.80, 1.59, 1.80, 2.10, 2.52, 2.43, 2.40, 2.58, 2.70, 2.91 and 3.06 m. Compute the area enclosed between the chain line, the curved boundary and the first and last offsets by (a) Trapezoidal and

(b) Simpson's Rule.

Q.4 List the instruments used for setting right angle and also discuss about optical square with diagram.

Q.5 Following are the bearing of line AB and AC.

i) AB N $15^0$15' E
AC N $87^0$10' E

ii) AB N 12^0 24' E
AC S 52^0 30' E

iii) AB S $58^0$50' E
AC S $22^0$45' W

iv) AB $339^0$35'
AC $160^0$40'

Calculate the angle BAC in each case.

Q.6 a) Discuss the steps of chain survey executed in the field.

b) Classify the leveling on the basis of principle of working.

Q.7 What is Plane Tabling? Write the methods of plane tabling, its advantages and limitations.

Q.8 The following consecutive readings were taken with a level and 4 m leveling staff on continuously sloping ground at a common interval of 30 m 0.585 on A, 0.936, 1.953, 2.846, 3.644, 3.938, 0.962, 1.035, 1.689, 2.534, 3.844, 0.956, 1.579, and 3.016 on B.

The elevation of 'A' was 520.450m. Make up a level book and apply the usual checks. Determine the gradient of line AB.

(P.T.O.)

Q.9 Define contouring; write its use and characteristics, also state the methods of locating contour lines.

Q.10 a) State the methods of computation of volume.

b) Discuss the steps for setting Theodolite over station.

SECTION "B"

Q.11 State True or False.

1) The revenue chains are 100 feet long and divided in 100 links.
2) Plumb Bob is used for testing the verticality of ranging rod.
3) The running of check line is necessary in traverse survey.
4) The horizontal distance between any two consecutive contours is known as the horizontal equivalent.

Q.12 Define the following terms.

1) Ranging
2) Reconnaissance
3) Magnetic meridian
4) GTS bench mark.

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: **II (New)**	**Term**	: **II**	**Academic Year**	: **2016-17**
Course No.	: FS 121	**Title**	: **Engineering Mechanics**		
Credits	: 3 (2+1)				
Day & Date	: Thursday, 04.05.2017	**Time**	: 09.00 to 12.00	**Total Marks**	: **80**

Note : 1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 The following forces act at a point: i) 20 N inclined at 30^0 towards North of East, ii) 25 N towards North, iii) 30 N towards North West, and iv) 35 N inclined at 40^0 towards South of West. Find the magnitude and direction of resultant force both Analytically and Graphically.

Q.2 a) Three forces of 2P, 3P and 4P act along the three sides of an equilateral triangle of side 100 mm taken in order. Find the magnitude and position of the resultant force.

b) Two unlike parallel forces of magnitude 400 N and 100 N are acting in such a way that their lines of action are 150 mm apart. Determine the magnitude of the resultant force and the point at which it acts.

Q.3 a) State and prove Lami's theorem.

b) Find the centre of gravity of a channel section 100 mm x 50 mm x 15 mm.

Q.4 a) Discuss various types of equilibrium when a body is acted upon by forces.

b) Find the centroid of an unequal angle section 100 mm x 80 mm x 20 mm.

Q.5 a) State and derive Theorem of Parallel Axis.

b) Determine the moment of inertia of a semicircular section of 100 mm diameter about its centre of gravity and parallel to X-X and Y-Y axes.

Q.6 a) State the laws of friction.

b) A body of weight 300 N is lying on a rough horizontal plane having a coefficient of friction as 0.3.Find the magnitude of the force, which can move the body, while acting at an angle of 25^0 with the horizontal.

Q.7 a) In a certain weight lifting machine, a weight of 1 kN is lifted by an effort of 25 N. While the weight moves up by 100 mm, the point of application of effort moves by 8 m. Find the Mechanical Advantage, Velocity ratio and efficiency of a machine.

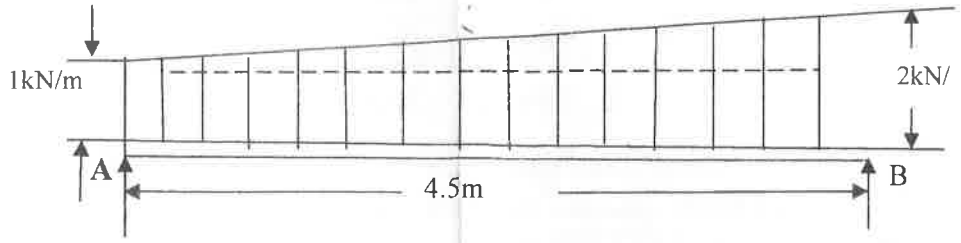
b) What is reversibility of a machine? Derive condition for the reversibility of a machine.

Q.8 a) Enlist different types of lifting machines. Explain Simple wheel and axle.

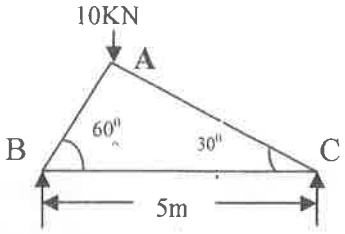
b) The larger and smaller diameters of differential wheel and axle are 80 mm and 70 mm respectively. The effort is applied to the wheel of diameter 250 mm. What is the velocity ratio? Find efficiency and frictional effort lost, when a load of 1050 N is lifted by an effort of 25 N.

(P.T.O.)

Q.9 a) A simply supported beam AB of span 4.5 m is loaded as shown in fig. Find the support reactions at A and B.



b) The truss ABC shown in figure has a span of 5 meters. It is carrying a load of 10kN at its apex. Find the forces in the members AB, AC and BC.



Q.10 a) Explain important types of loading on a beam.

b) Explain in detail different types of frames.

SECTION "B"

Q.11 Fill in the blanks.

1) The process of finding out the resultant force of a number of given forces is called _____ of forces.

2) The ratio of limiting friction to the normal reaction between the two bodies is known as _____.

3) The Lami's theorem is applicable only for _____ forces.

4) The C.G. of a semicircle is at a distance of _____ from its base measured along the vertical radius.

5) One of the characteristics of a _____ is that it can cause a body to move in the direction of the greater force.

6) If the sum of all the forces acting on a body is zero, then the body may be in equilibrium provided the forces are _____.

7) The _____ of friction depends upon the roughness of the surfaces.

8) Velocity Ratio of Differential Wheel and Axle is _____.

Q.12 Match the following pairs.

"A"	"B"
1) Ideal Machine	a) Moment of Inertia
2) Parallelogram law of forces	b) Derived unit
3) Statics	c) Mechanical Advantage = Velocity Ratio
4) Velocity	d) Resultant force
5) Routh's rule	e) Imperfect
6) Coefficient of friction	f) Weight lifted / Effort applied.
7) Mechanical advantage	g) Limiting friction / Normal reaction
8) Redundant Frame	h) Branch of Engineering Mechanics

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: **II (New)**	**Term**	: **II**	**Academic Year**	: **2016-17**
Course No.	: APE 121	**Title**	: **Thermodynamics**		
Credits	: 3 (2+1)				
Day & Date	: Tuesday, 02.05.2017	**Time**	: 09.00 to 12.00	**Total Marks**	: **80**

Note :
1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 a) A gauge fitted to steam condenser indicates 700 mm of mercury when the barometer records 760 mm of mercury. Calculate the absolute pressure in the condenser in N/m^2 , bar and kPa.

b) Define thermodynamic system. Give its classification and explain any one.

Q.2 Differentiate between the following.

1) Extensive Properties and Intensive properties.

2) Water tube boiler and fire tube boiler.

Q.3 a) What is the first law of thermodynamics? Give the limitations of first law of thermodynamics.

b) Write in brief about Boyle's law and Charles' law.

Q.4 Explain in brief about Kelvin Planck and Clausius statement.

Q.5 3 kg of an ideal gas is expanded from a pressure 7 bar and volume 1.5 m^3 to a pressure 1.4 bar and volume 4.5 m^3. The change in internal energy is 525 kJ. The specific heat at constant volume for the gas is 1.047 kJ/kg^0K.

Calculate:

1) Gas constant 2) Change in enthalpy 3) Initial and final temperatures.

Q.6 a) A gas occupies a volume of 0.1 m^3 at a temperature of 20^0C and a pressure of 1.5 bar. Find the final temperature of the gas, if it is compressed to a pressure of 7.5 bar and occupies a volume of 0.04 m^3.

b) What is specific heat of gases? Explain in brief about Specific heat of gas at constant volume (Cv).

Q.7 a) Give the classification of thermodynamic process. Derive expression for work done during non flow polytropic process ($pv^n = C$)

b) One liter of hydrogen at 0^0C is suddenly compressed to one half of its volume. Find the change in temperature of the gas, if the ratio of two specific heats for hydrogen is 1.4.

Q.8 Derive the expression for pressure, work done, change in internal energy and change in enthalpy of a isothermal process.

(P.T.O.)

Q.9 a) Enlist the different boiler mountings. Explain in brief construction of water level indicator.

b) Enlist the important requirements of a good steam boiler.

Q.10 a) A quantity of air has a volume of 0.4 m^3 at a pressure of 5 bar and a temperature of 80^0C. It is expanded in a cylinder at a constant temperature to 1 bar pressure. Determine the amount of work done by the air during expansion.

b) State and explain general gas laws for expansion and compression.

SECTION "B"

Q.11 State True or False.

1) With increase in pressure, boiling point of water increases and enthalpy of evaporation decreases.
2) In International System of Units (i.e. S.I. Units), mass is taken in kg and weight in Newton.
3) Specific heat of air at constant pressure is 3 kJ/kg^{0}K.
4) The value of gas constant (R) is 287 J/kg^{0}K.
5) The specific volume of water when heated from 0^0C, first decreases and then increases.
6) The isentropic process, on the Mollier diagram is represented by a horizontal line.
7) Zeroth law of thermodynamics states that the energy can neither be created nor destroyed.
8) The work done for a non flow isochoric process is zero.

Q.12 Fill in the blanks.

1) The specific heat at constant pressure is _____ than that of specific heat at constant volume.
2) The general law for expansion and compression of gases is $pv^n = c$, the process is said to be hyperbolic if n is equal to _____.
3) _____ is the ratio of mass of actual dry steam to the mass of same quantity of wet steam.
4) The property of a working substance which increases or decreases as the heat is supplied or removed in a reversible manner, is known as _____.
5) The enthalpy of dry saturated steam _____ with the increase in pressure.
6) A device used to put off fire in the furnace of the boiler when the level of water in the boiler falls to an unsafe limit is called _____.
7) _____ boiler is a multi tubular, horizontal, internally fired and mobile boiler.
8) The change in internal energy for non flow isothermal process is _____.

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
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B.Tech. (Agril. Engg.)

Semester	: **II (New)**	**Term**	: **II**	**Academic Year**	: **2016-17**
Course No.	: FMP 123	**Title**	: **Workshop Technology**		
Credits	: 2 (1+1)				
Day & Date	: Saturday, 29.04.2017	**Time**	: 9.00 to 11.00	**Total Marks**	: **40**

Note :
1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 What are properties that an element must have to be considered as a metal?

Q.2 What is foundry engineering? Enlist different stages of producing casting.

Q.3 Describe draft allowance and chamber allowance in patterns.

Q.4 What are the main defects of welding joints?

Q.5 Discuss size of lathe.

Q.6 Discuss radial drilling machine.

Q.7 Give classification of milling machine.

Q.8 Discuss vertical type shaper.

Q.9 Enlist different types of moulding sand and explain green sand.

Q.10 Explain cope and drag pattern.

SECTION "B"

Q.11 Fill in the blanks.

1) A molecule that consists more than two atoms is called _____.
2) The processes of reduction of iron ore to pig iron is known as _____.
3) Solid pattern is not attached to a frame or plate and is, therefore, some times known as _____.
4) _____ lathe is used for small and precision work.

Q.12 State True or False.

1) A solid is an ordered cluster of molecules.
2) The melting point of non-ferrous metals is generally lower than that of ferrous metals.
3) Rammer, a wooden tool is used for repairing and finishing small surfaces of the mould.
4) Sensitive drilling machine is designed for drilling large holes at high speed in light jobs.

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: **II (New)**	**Term**	: **II**	**Academic Year**	: **2016-17**
Course No.	: BS-MATH 124	**Title**	: **Engineering Mathematics – II**		
Credits	: 3 (2+1)				
Day & Date	: Thursday, 27.04.2017	**Time**	: 09.00 to 12.00	**Total Marks**	: **120**

Note :
1. Solve **ANY EIGHT** questions from **SECTION "A".**
2. All questions from **SECTION "B"** are compulsory.
3. All questions carry equal marks.
4. Draw neat diagrams wherever necessary.

SECTION "A"

Q.1 a) Using Gauss-Jordon method, find the inverse of the following matrix.

$$A = \begin{bmatrix} 8 & 4 & 3 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$$

b) Find the eigen values of following matrix.

$$A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

Q.2 a) Solve: $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$

b) Solve: $p^3 + q^3 = 27z$

Q.3 Find Fourier series for the function $f(x) = e^{-ax}$ in the interval $-\pi < x < \pi$

Q.4 a) Investigate for what values of λ and μ, the simultaneous equations

$$2x + 3y + 5z = 9$$
$$7x + 3y - 2z = 8$$
$$2x + 3y + \lambda z = \mu$$

have no solution.

b) If f(z) is analytic function with constant modulus, show that f(z) is constant.

Q.5 a) Find the analytic function whose real part is $\frac{\sin 2x}{\cos 2y - \cos 2x}$

b) Test convergence of the series

$$\left(\frac{1}{3}\right)^2 + \left(\frac{1.2}{3.5}\right)^2 + \left(\frac{1.2.3}{3.5.7}\right)^2 + \ldots\ldots\ldots\ldots \infty$$

Q.6 a) Reduce the following matrix into its normal form and hence find its rank.

$$A = \begin{bmatrix} 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 9 \\ 11 & 12 & 13 & 14 \\ 16 & 17 & 18 & 19 \end{bmatrix}$$

(P.T.O.)

b) Show that the transformation.
$y_1 = x_1 + x_2 + x_3$; $y_2 = 2x_1 + x_2 + 4x_3$; $y_3 = x_1 - x_2 + 4x_3$ is regular.

Q.12

Q.7 a) Discuss convergence of the series $1 + \frac{1.3}{1.4} + \frac{1.3.5}{1.4.7} + ...\infty$

b) Find the half range sine series for the function given by
$f(x) = x^2$ for $0 < x < \pi$

Q.8 a) Find Fourier series expansion for the function f(x) given by
$f(x) = x - \pi$, $-\pi \le x \le 0$
$= \pi + x$, $0 < x \le \pi$

b) State and prove Leibnitz's rule for the convergence of alternating series.

Q.9 a) Find the values of x for which the series

$$1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + ... + \frac{n(n-1)(n-2).....(n-r+1)}{r!}x^r +$$

$.....\infty$ is convergent.

b) Verify the Caley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix}$.

Q.10 a) Form the partial differential equation by eliminating the arbitrary function from the relation $f(x^2 + y^2, z - xy) = 0$

b) Show that the transformation $y_1 = \cos\alpha\, x_1 - \sin\alpha\, x_2$; $y_2 = \sin\alpha\, x_1 + \cos\alpha\, x_2$ is orthogonal.

SECTION "B"

Q.11 Define/ State the following terms.

1) Normal form of the matrix
2) Consistent linear system of equations
3) Orthogonal transformation
4) Eigen value of a square matrix
5) Cauchy-Riemann equations
6) Regular function
7) Dirichlet's conditions for Fourier expansion of a function
8) Half range cosine series
9) Lagrange's linear equation
10) Non-linear partial differential equation of the first order
11) Logarithmic test for the convergence of infinite series
12) Oscillatory series

(Contd.)

Q.12 Fill in the blanks.

1) If all minors of a matrix of order $r+1$ are zero then its rank is _____.

2) If the normal form of the matrix A is $\begin{bmatrix} I_2 \\ O \end{bmatrix}$ then $\rho(A) =$ _____.

3) If the square matrix A is orthogonal then $|A| =$ _____.

4) The linear transformation Y = AX is called non-singular transformation if _____.

5) If the function $w = u + iv = f(z)$ is analytic function in the region R then $\frac{dw}{dz} =$ _____.

6) If a periodic function f(x) is odd, its Fourier expansion contains only _____ terms.

7) The Fourier series for the function f(x) in the interval $\alpha < x < \alpha + 2c$ is given by _____.

8) The geometric series $1 + r + r^2 + r^3 + \ldots\ldots \infty$ is convergent if _____.

9) The exponential series is convergent for _____.

10) The solution of the partial differential equation $z = px + qy + \sqrt{1+p^2+q^2}$ is _____.

11) $\int_{\alpha}^{\alpha+2\pi} \sin mx . \sin nx dx =$ _____ $(m \neq n)$

12) The series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1} n}{2n-1}$ is _____ series.

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