MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: II(New)	**Academic Year**	: 2007-08
Course No.	: **FMP-123**	**Title**	: **Workshop Technology**
Credits	: 2(1+1)		
Day & Date	: Tuesday, 6.5.2008	**Time**	: 9.00 to 11.00 **Total Marks:** 40

Note :
1. Solve ANY FIVE 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 crystal lattices? Explain various types of crystal lattice structure with neat sketch.

Q.2 What do you mean by pattern? What are various types of pattern? Explain any three with neat sketch.

Q.3 Give classification of Lathe machine? Explain in short feed mechanism in lathe machine.

Q.4 Explain Sensitive Drilling machine with neat sketch.

Q.5 Write a short note on Twist drill. Explain geometry of Twist drill with neat sketch.

Q.6 What do you mean by Submerged arc welding? Explain it with neat sketch; What are applications of submerged arc welding?

Q.7 State proper use of following tools used in bench work and fitting.
1) Surface plate 2) V-block 3) Reaming 4) Scriber 5) Try square

SECTION "B"

Q.8 Fill in the blanks:
1) _____ is a process of producing hard surface layer on alloy steel.
2) In arc welding eyes need to be protected against _____.
3) The flux used in submerged arc welding is in the form of _____.
4) Lathe spindle is hollow to _____.
5) Green sand consists of _____ to _____ % of clay.

Q.9 State True or False:
1) Acetylene stored in gas cylinder is in liquid form.
2) Extrusion is one of the casting processes.
3) Cores are used to make desired recess in casting.
4) Sprue in casting refers to vertical passage.
5) Power requirement with increase in cutting speed increases linearly in machining.

Q.10 Define the following terms:
1) Welding 2) Tool life 3) Cope and Drag 4) Ferrite 5) Die-Casting

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester	: II(New)	**Academic Year**	: 2007-08
Course No.	: **AG-124**	**Title**	: **Soil Science**
Credits	: 2(1+1)		
Day & Date	: Thursday, 8.5.2008	**Time**	: 9.00 to 11.00 **Total Marks:** 40

Note :
1. Solve ANY FIVE 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) Explain various soil moisture constants. (3)
b) Differentiate between bulk density and particle density of soil. (2)

Q.2 a) What are the factors influencing soil temperature? (3)
b) Classify the soils as per land use capability classes. (2)

Q.3 a) Give the significance of soil texture. (3)
b) Mention factors influencing the composition of soil air. (2)

Q.4 a) How the cations are adsorbed on the soil colloids? (3)
b) What are the factors considered for recommendation of fertilizers? (2)

Q.5 a) What is the importance of cation exchange in plant nutrition? (3)
b) What are the factors influencing the buffering capacity of soil? (2)

Q.6 a) Enlist criteria considered for evaluating the quality of irrigation water. (3)
b) What are the factors influencing the decomposition of plant residue in soil environment? (2)

Q.7 a) Classify important nitrogenous and phosphatic fertilizers with suitable examples. (3)
b) Enlist the factors influencing soil available water (2)

SECTION "B"

Q.8 Choose the correct answer

1) The elements playing direct role in formation of chlorophyll are _____.
   a) Phosphorus and Potassium
   b) Nitrogen and Magnesium
   c) Calcium and Zinc
   d) Iron and Sulphur

2) Available soil water is the portion of water held by the soil in between _____.
   a) 1 and 15 bars
   b) –1/3 and –15 bars
   c) 1/3 and 12 bars
   d) 2 and 10 bars

3) A new comprehensive soil classification is based on popularly known as _____.
   a) 7^{th} Approximation
   b) Soil taxonomy
   c) a and b both
   d) None of the above

P.T.O.

4) The problems of saline soils is reclaimed by means of _____.
   a) Leaching
   b) Gypsum
   c) Addition of urea
   d) Calcium Carbonate

5) Humus is _____.
   a) Crystalline in nature
   b) Inorganic in nature
   c) Colloidal in nature
   d) None of these

Q.9 Define the following terms.

1) Soil
2) Mineral
3) Essential nutrient
4) Alkali soil
5) Weathering

Q.10 State true or false:

1) The chemical composition of calcite mineral is $CaCO_3$.
2) Among the soil separates, clay fraction is having biggest size.
3) The upper plastic limit is also called liquid limit.
4) The magnitude of active acidity is more than exchange acidity.
5) Soils having exchangeable sodium percentage greater than 4 are considered as sodic soils.

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SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester : II (New)	**Academic Year** : 2007-08		
Course No. : **SWCE-121**	**Title** : **Surveying and Leveling**		
Credits : 3 (1+2)			
Day & Date : Friday, 9.5.2008	**Time** : 9.00 to 11.00	**Total Marks** : 40	

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

SECTION "A"

Q.1 Define surveying and leveling. What is its objective and give the classification of surveying?

Q.2 a) Plot the following cross staff survey. Also determine the area of the field.

▽	100B	
	80	20 D
E 10	70	
	50	
F 40	20	10 C
△	0 A	

b) What are the types of ranging? Explain in detail.

Q.3 a) The actual distance between two stations is 1 km. This distance was measured with 20 meter chain which was noticed to be 19.8 m. Determine the distance measured by chain.

b) What are the instruments used to make right angles in surveying?

Q.4 a) Describe the construction and use of hand level.

b) What is meant by local attraction? How it is detected and corrected.

Q.5 a) Following are the observed fore bearing of the line.
AB $38^0 14'$, BC $142^0 18'$, CD $208^0 37'$, and DE $318^0 26'$. Find their back bearings.

b) State the characteristics of contour line.

Q.6 Write short note on (Any Two)
a) Offset's b) Magnetic meridian c) Plannimeter

Q.7 The following consecutive readings were taken with a dumpy level.

0.894, 1.643, 2.896, 3.016, 0.954, 0.692, 0.582, 0.251, 1.532, 0.996, 2.0135. The instrument was shifted after the fourth and eight readings. The first reading was taken on the staff held on the benchmark of RL 820.765. Rule out a page of a level field book and enter the above readings. Calculate the reduced levels of the points and show the usual checks. What is difference of level between first and last points?

P.T.O.

SECTION "B"

Q.8 Fill in the blanks:

1) The principle of chain survey is _____
2) Plane table survey is most suitable for preparing _____ scale map.
3) The quadrantal bearing never exceeds. _____
4) Length of gunter's chain is _____
5) Tallies are fixed on chain at _____ meter length.

Q.9 State true or false:

1) Back sight is also called plus sight.
2) In plane surveying curvatures are taken into consideration.
3) The line not joining the points of equal heights is called contour line.
4) Engineer's chain is 66 m long.
5) The elevation of a point above or below the datum is known as reduced level.

Q.10 Define the following:

1) Bench mark
2) Orientation of plane table.
3) Traverse survey
4) Tie line
5) Back bearing

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester : II(New)	**Academic Year** : 2007-08		
Course No. : **EOES-122**	**Title** : **Applied Electronics and Instrumentation**		
Credits : 3(2+1)			
Day & Date : Saturday, 10.5.2008	**Time** : 9.00 to 12.00	**Total Marks:** 80	

Note :
1. Solve ANY FIVE 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) Explain forward biasing and reverse biasing for pn junction.
b) State significance of ripple factor in rectifiers. Derive equations for both rectifiers.

Q.2 a) State and explain applications of diode.
b) What is filter? Give different types along with their working.

Q.3 a) Classify transistor amplifiers. Explain any one in detail.
b) State and explain linear and non linear applications of op-amp.

Q.4 a) Explain zener diode voltage regulator.
b) Give working for binary ladder D/A converter.

Q.5 a) Draw the block diagram of the functional element of an instrument and explain the function of each element.
b) Explain different sensors used for displacement measurements.

Q.6 a) State and explain different methods for temperature measurement.
b) Explain the working of tacho-generator.

Q.7 a) How potentiometric pressure transducer works?
b) What is force? Discuss about various methods of force measurement.

SECTION "B"

Q.8 Fill in the blanks:
a) The average deviation is an indication of the _____ of the instrument.
b) Diode acts as a rectifier because of its _____ property.
c) The output of a CE amplifier is _____ ^{0} out of phase with input.
d) In a transistor, base region is _____ doped.
e) The pentavalent doping atom is called _____ atom.
f) _____ forms majority charge carriers in N-type semiconductors.
g) A semiconductor diode has _____ pn junction.
h) A semiconductor is formed by _____ bonds.
i) The leakage current in a pn junction is of the order of _____
j) The forward voltage drop across a silicon diode is about _____

P.T.O.

Q.9 State true or false:

1) Backlash is a lost motion or free play, which is inherent in mechanical elements.
2) The output voltage of LVDT is practically linear for displacements up to 5 mm.
3) When calculating pressure, use only that part of the force that acts at right angles to the surface.
4) Thermocouples require bridge circuits.
5) A thermopile consists of several thermistors connected in series.
6) Transistor biasing generally provided by a diode.
7) A clamping circuit adds a. c. component to the signal.
8) When the transistor (CE arrangement) is in the cut off region, the collector current is I_{CEO}.
9) A negative clipper removes the negative half cycle of the input voltage.
10) In a phase shift oscillator, the frequency determining elements are L and C.

Q.10 Match the pairs:

"A"	"B"
1) Commutative law	a) $\overline{(A+B)} = \overline{A} \cdot \overline{B}$
2) Associative law	b) A.B = B.A
3) Distributive law	c) A.(B.C)=(A.B).C
4) De-Morgan's theorem	d) C=A+B
5) Logic AND operation	e) A.(B+C) = A.B+A.C
6) Logic OR operation	f) C=A.B.
7) Logic NAND operation	g) $C=A \Theta B$
8) Logic NOR operation	h) $C = \overline{A.B}$
9) Logic NOT operation	i) $C = \overline{A+B}$
10) Logic Ex-OR operation	j) $A = \overline{A}$

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SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester : II (New)		**Academic Year** : 2007-08	
Course No. : **FS-121**		**Title** : **Engineering Mechanics**	
Credits : 3 (2+1)			
Day & Date : Monday, 12.5.2008	**Time** : 9.00 to 12.00		**Total Marks : 80**

Note :
1. Solve ANY FIVE 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"

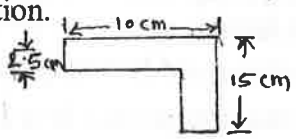
Q.1 a) Two forces act at an angle 120^0. The bigger is 40N and resultant is perpendicular to smaller one. Find smaller force.

b) State and explain law of parallelogram of forces.

Q.2 a) Enlist any five types of lifting machines.

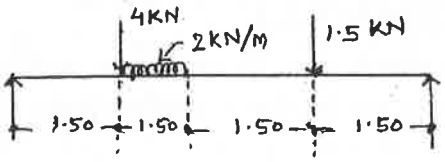
b) Find center of gravity of a 100 mm x 150 mm x 30 mm T-Section.

Q.3 a) Find moment of Inertia of a L-section as shown in fig. about X-X and Y-Y axes through the C.G. of the section.



b) State and explain Varignon's principle of movement.

Q.4 a) Simply supported beam AB of span 6 m is loaded as shown in Fig. Determine support reactions.



b) State assumptions in the theory of simple bending.

Q.5 a) A bar of 200 mm long and 20 mm dia meter is stretched by 0.70 mm by an axial pull of 22 kN calculate stress, strain and modulus of elasticity of the bar.

b) Explain in detail graphical method to find resultant of parallel forces.

Q.6 a) A simply supported beam of span 5 m carries two point loads of 5 kN and 7 kN at 1.5 m and 3.5 m from left hand support respectively. Draw SFD and BMD. Showing all-important values.

b) Differentiate between perfect frame and imperfect frame.

Q.7 a) Simply supported beam 200 mm x 400 mm deep carries a shear force of 10 kN at a certain section. Sketch the typical shear stress diagram and indicate maximum value of shear stress.

b) State and explain Lamis Theorem.

P.T.O.

SECTION "B"

Q.8 Fill in the blanks:

1) The forces which meet at one point are known as _____
2) The law of lifting machine is governed by the relation _____
3) The load acting at a point on a beam is known as _____
4) The C.G. of a hemisphere is at a distance of _____ from its base, measured along vertical radius.
5) Set of forces, whose resultant is zero, are called as _____ forces.
6) _____ is the force by which body is attracted towards the center of the earth.
7) The ratio of the load lifted to the effort applied is known as _____
8) The ratio of the limiting friction to the normal reaction between the two bodies is known as _____
9) For solid circular section of diameter D then section modulus Z_{xx} = _____
10) $M/I = \sigma/Y = E/R$ is known as _____ formula.

Q.9 State True or False:

1) The forces whose line of action lies on the same plane are known as coplanar forces.
2) The Ratio of the velocity ratio to the mechanical advantage is known as efficiency of the machine.
3) Every body has one and only the center of gravity.
4) The process of finding out resultant of a number of given forces is called as composition of force.
5) The C.G. of uniform rod is at its quarter point.
6) Moment of inertia is expressed in m^3.
7) Sliding friction is the friction experienced by the body, when it rolls over the other body.
8) Simply supported beam of span L and carrying central point load W then maximum moment is given by WL/4.
9) Shear stress distribution for rectangular section is non parabolic.
10) At point where shear force is zero is a point of maximum bending moment.

Q.10 Define the following terms:

1)Engineering mechanics
2)Shear force and bending moment
3)Section modulus
4)Limiting friction
5)Deficient frame
6)Centre of gravity
7)Polar moment of inertia
8)System of forces
9)Like parallel forces
10)Angle of friction

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester : II(New)	**Academic Year** : 2007-08		
Course No. : **APE-121**	**Title** : **Thermodynamics**		
Credits : 3(2+1)			
Day & Date : Wednesday, 7.5.2008	**Time** : 9.00 to 12.00	**Total Marks:** 80	

Note :
1. Solve ANY FIVE 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) State first law of thermodynamics and explain its limitations. (3)

b) What are the assumptions of steady flow process and derive general energy equation for steady flow process. (7)

Q.2 a) State 'Kelvin-plank' statement and explain thermal efficiency.

b) A heat engine is supplied heat at the rate of 3600 kJ/min and gives an output of 20 kW. Determine the thermal efficiency and the rate of heat rejection.

Q.3 a) A gas at a temperature of 333^0 C and 20-bar pressure has a volume of 0.06 m^3. It is expanded to a volume of 0.54 m^3. If the temperature of gas after expansion is 30^0 C, determine final pressure in mm of Hg.

b) A gas has Cp and Cv value as 1.96 and 1.5 kJ/kg-K respectively. Determine gas constant and molecular mass of gas.

Q.4 a) Derive for constant volume process. $\Delta H = m.cp(T2-T1)$ (4)

b) One kg of gas at 300 K is heated in a closed vessel from a pressure of 2 to 5 bar determine change in internal energy. (Assume Cv=0.712kJ/kg-K). (6)

Q.5 a) Derive equation for work done during adiabatic process. (4)

b) The initial volume of 0.18 kg of a certain gas was 0.15 m^3 at a temperature of 15^0 C and a pressure of 1 bar. After adiabatic compression to 0.056m^3 the pressure was found to be 4 bar. Find gas constant, molecular mass of gas, ratio of specific heats and change of internal energy. (6)

Q.6 a) Derive, $\Delta S = m[Cv.\ln P_2 / P_1 + Cp.\ln V_2 / V_1]$

b) A gas occupies 0.56 m^3 at 400^0C and 28 bar is expanded isothermally to 2.8 m^3. Find change in entropy. Assume R=287 J/kg-K.

Q.7 a) The internal energy of 1 kg of steam at a pressure of 20 bar is 2200 kJ. Calculate the dryness fraction.

b) Calculate entropy pf 5 kg of steam at 10 bar pressure if (i) x = 0.85 and (ii) Degree of super heat of 70^0C.

(P.T.O.)

SECTION "B"

Q.8 State True or False:

1) A perpetual motion machine of second kind does not violet the first law of thermodynamics.
2) The atmosphere acts as a cold body in case of a heat pump.
3) Second law of thermodynamics defines internal energy.
4) During expansion process, work done by the system is negative.
5) The sum of (U+P.V) is termed as entropy.
6) During non-steady process, the rate of work transfer is constant.
7) The entropy is an extensive property.
8) The ratio of Cp/Cv for air is 1.4
9) Dryness fraction is a measure of steam quality.
10) The atmospheric pressure is 1.033 bar.

Q.9 Fill in the blanks:

1) During a process, if the deviation of property from equilibrium state is infinitesimal, the process is called _____
2) The energy capable of crossing the system boundaries is known as _____
3) The engine which has 100% thermal efficiency is called _____
4) The atmosphere acts as a _____ in case of a refrigenrator.
5) The ratio of Cp/Cv is known as _____
6) The value of universal gas constant in SI unit is _____
7) The reversible adiabatic process is known as _____
8) The hyperbolic process is governed by _____ law.
9) The change in entropy is _____ when heat is absorbed by the gas.
10) During _____ process $PV^n=C$.

Q.10 Match the pairs:

"A"		"B"	
1)	1 kgf force	a)	1.013 bar
2)	Specific heat of water	b)	4.187 kJ/kg-K
3)	Pressure 1 bar	c)	2.09 kJ/kg-K
4)	Steam quality	d)	0.1 MN/m^2
5)	Specific heat of air	e)	9.81 N
6)	Pressure 1 mm Hg	f)	Dryness fraction
7)	Adiabatic index of air	g)	1.00 kJ/Kg-K
8)	Universal constant	h)	8.314 kJ/kg-mole-K
9)	Atmospheric pressure	i)	1.4
10)	Specific heat of steam	j)	133.3 Pascal

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MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, PUNE
SEMESTER END EXAMINATION

B.Tech. (Agril. Engg.)

Semester : II(New)		**Academic Year** : 2007-08	
Course No. : **BS-MATH-124**		**Title** : **Engineering Mathematics-II**	
Credits : 3(2+1)			
Day & Date : Monday, 5.5.2008		**Time** : 9.00 to 12.00	**Total Marks:** 120

Note : 1. Solve ANY FIVE 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) Test the convergence of the series $1-\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{3}}-\frac{1}{\sqrt{4}}+.....$

b) Find the rank of matrix

$$A=\begin{bmatrix}1 & 2 & 3 & 0\\ 2 & 4 & 3 & 2\\ 3 & 2 & 1 & 3\\ 6 & 8 & 7 & 5\end{bmatrix}$$

c) Form the partial differential equation(by eliminating the arbitrary constants) from
$Z = f(x + at) +,g(x- at)$

Q.2 a) Find the eigen values and eigen vectors of the matrix (8)

$$A=\begin{bmatrix}6 & -2 & 2\\ -2 & 3 & -1\\ 2 & -1 & 3\end{bmatrix}$$

b) Obtain half range sine series for the function (7)
$f(t) = t - t^2$, the range in (0,1).

Q.3 a) Solve $(x^2 - y^2 - z^2)p + 2xyq = 2xz$ (8)

b) Test the consistency and solve (7)

$3x - 3y + 7z = 5$
$3x + y - 3z = 13$
$2x + 19y - 47z = 32$

Q.4 a) If $f(x) = |\cos x|$,Expand f(x) as a Fourier series in the interval$(-\pi, \pi)$. (10)

b) Determine whether the function $f(z) = 2xy + i(x^2 - y^2)$ is analytic. (5)

Q.5 a) Verify cayley Hamiltonian theorem for the matrix (8)

$$A=\begin{bmatrix}7 & 2 & -2\\ -6 & -1 & 2\\ 6 & 2 & -1\end{bmatrix}$$

P.T.O.

b) Test the convergence of the series $x-\frac{x^2}{2}+\frac{x^3}{3}-\ldots\ldots+(-1)^n\frac{x^n}{n}+\ldots..$

Q.6 a) An alternating current after passing through a rectifier has the form

$f(x) = I_0 \sin x$ for $0 \le x \le \pi$

$= 0$ for $\pi \le x \le 2\pi$

Where I_0 is the maximum current and the period is 2π. Express f(x) in Fourier series.

b) Solve $\frac{\partial^2 z}{\partial x^2}+z=0$ given that when $x = 0$, $z = e^y$ & $\frac{\partial z}{\partial x}=1$

Q.7 a) State and prove Cauchy - Riemann equation in Cartesian form. (5)

b) Is the matrix A orthogonal? where (10)

$$A=\begin{bmatrix} 2 & -3 & 1 \\ 4 & 3 & 1 \\ -3 & 1 & 9 \end{bmatrix}$$ (5)

SECTION "B"

Q.8 State/Define the following

1) Modal Matrix
2) Limit of a complex function
3) Rouche's theorem
4) Periodic function
5) Alternating series
6) Rank of a matrix
7) Lagrange's linear equation
8) Singular point
9) Harmonic function
10) Absolutely convergent series
11) Skew- symmetric matrix
12) Characteristic equation
13) Odd function
14) Cayley-Hamiltonian Theorem
15) Divergent series

Q.9 Fill in the blanks.

1) If f(x) is even function in the interval $(-\pi, \pi)$, then in the Fourier series the value of b_n = _____

2) $2z = x p + y q$ is the partial differential equation of the order .....

3) The series 1 -1 +1 -1+1- 1 +-------is an _____series

4) $(ABC)^{-1}$ = _____

5) A function $w = f(z)$ is said to be _____at $z = z_0$ if $\lim_{z \to z_0} f(z) = f(z_0)$

6) $\int_c^{c+2\pi} Sinnx\, dx =$ _____

7) $f(x) = \cos x$ is a periodic function with period _____

8) $\frac{1}{|A|} \cdot adjA =$ .....

9) If $\lim_{n \to \infty} u_n \neq 0$, the series $\sum u_n$ must be_____

(7) 10) The partial differential equation of the first order can be written as
$f(x, y, z, p, q) = 0$ where $p =$ _____

(10) 11) If A is orthogonal matrix then $A^{-1} =$ _____

12) Log z = _____ where z is a complex variable

13) If A is square matrix then (adj A) A= _____ I

14) $A\ A^{-1} =$ _____

15) If rank of coefficient matrix A is equal to number of equations then the system has _____ solution.

(5) Q.10 State true or false.

(10) 1) Graphically an even function is symmetrical about the y-axis.

(5) 2) $(A')' = I$

3) An absolutely convergent series is necessarily convergent but not conversely.

4) Every square matrix satisfies its own characteristic equation

5) In alternating series, the terms are alternately positive and negative

6) The series 6-10+4+6-10+4+6-10+.....is oscillatory.

7) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \ldots\ldots\ldots$ is power series.

8) Let A and B be two matrices such that A=0, AB=0, the equation always implies that B=0.

9) In partial differential equation, there are more then one independent variables.

10) If is λ an eigen value of a matrix A, then $\frac{1}{\lambda}$ is also an eigen value of A

11) If $|A| = 0$ then A^{-1} exist.

12) If $\frac{u_n}{u_{n+1}}$ does not involve n as an exponent or a logarithm, the series $\sum u_n$ converges

13) Eigen values of an orthogonal matrix are either +1 or -1

14) A function f (z) which is single valued and possesses a unique derivative with respect to z at all points of a region R, is called a regular function of z in that region.

15) Inverse of a matrix is unique

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