



Dr T THIMMAIAH INSTITUTE OF TECHNOLOGY

DEPARTMENT OF MINING ENGINEERING

Subject: Mineral Processing & Fuel Technology

Subject Code: 18MN63

Faculty Name: Paul Prasanna Kumar

Sem: VI

QUESTION BANK

MODULE-I

1. Explain the objectives and scopes of mineral processing. (08 Marks)
2. Explain Comminution and its stages. (08 Marks)
3. With sketches, explain the principles of Comminution. (10 Marks)
4. With equations, explain the theories of Comminution. (06 Marks)
5. With neat sketch, explain the working principle of Blake Jaw Crusher. (08 Marks)
6. With neat sketch, explain the working principle of tumbling mill. (08 Marks)
7. Define Comminution, its objectives and principles. (08 Marks)
8. Write a note on objectives of mineral processing. (05 Marks)
9. Write a note on scope of mineral processing. (05 Marks)
10. What are the different types of mechanical sorting? Explain the type of sorter which is used to sort iron ore, with neat sketch. (10 Marks)
11. What are the different types of manual sampling? Explain each briefly. (12 Marks)
12. With neat sketch, explain Vezin sampler. (08 Marks)
13. Explain about theories of comminution. State the different theories of comminution with their formula. (10 Marks)
14. Explain in detail about Jaw Crusher with a neat sketch. (10 Marks)
15. With a neat sketch, explain the working principle of ball mill. (10 Marks)
16. With neat sketch, explain the working principle of Blake Jaw Crusher. (08 Marks)
17. With neat sketch, explain the working principle of tumbling mill. (08 Marks)
18. Explain the working principle of Jaw crusher with neat sketch. (08 Marks)
19. Explain the working principle of Cone crusher with neat sketch. (08 Marks)
20. Define Crushing of ore and different types of crushing of ore. (08 Marks)
21. Write in detail on different gravity equipment used for mineral processing. (08 Marks)

MODULE-II

1. With neat sketch, explain the working of Trommel (or) Revolving screen. (08 Marks)
2. With a neat sketch, explain the working of Cyclone separator (or) hydrocyclone. (08 Marks)
3. Write notes on Settling of solids in fluids. (08 Marks)
4. Write notes on Mechanical classifiers. (08 Marks)
5. Write notes on Heavy media separation by cyclones. (08 Marks)
6. With a neat sketch, explain about the vibrating screen. (10 Marks)
7. With a neat sketch, explain about the working principle of spiral classifier. (10 Marks)
8. Discuss about the liberation and its concepts. (08 Marks)
9. Explain about the importance of sizing. (08 Marks)
10. Explain about the purpose and working principle of grizzly with neat sketch. (08 Marks)

MODULE-III

1. Classify flotation reagents. Explain them in detail. (08 Marks)
2. Write notes on the floatation of coal. (08 Marks)
3. Write notes on Reagent in froth floatation methods. (08 Marks)
4. Write notes on Electrical method of concentration, application and limitation. (08 Marks)
5. With a neat sketch, explain the working principle of jigging. (10 Marks)



Dr. T. THIMMAIAH INSTITUTE OF TECHNOLOGY
Department of Mechanical Engineering

Dynamics of Machines (17ME52)

QUESTION BANK
MODULE 1

- 1) Explain the equilibrium of body under the action of two forces, three forces and two forces with a torque.
- 2) A four link mechanism is acted upon by forces as shown in figure. Determine the torque T_2 to be applied on link 2 to keep the mechanism in equilibrium.
 $AD = 50\text{mm}$, $AB = 40\text{MM}$, $BC = 100\text{mm}$, $DC = 75\text{mm}$, $DE = 35\text{mm}$


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QUESTION BANK MODULE 2

- 1) Explain static balancing and dynamic balancing in rotating masses.
- 2) Explain briefly the balancing of several masses in different planes.
- 3) A shaft carries 4 masses in parallel planes A, B, C and D in this order along its length. The mass at B and C are 18kg and 12.5kg respectively, and each has an eccentricity of 60mm. The masses at A and D have an eccentricity of 80mm. The angles between the masses at B and C are 100° and that between the masses at B and A is 190° , both being measured in the same direction. The axial distance between the planes A and B is 100mm and that between B and C is 200mm. If the shaft is completely under dynamic balance, determine:
 - (i) The magnitude of the masses at A and D.
 - (ii) The distance between the planes A and D.
 - (iii) Angular position of the mass at D.
- 4) A shaft carries four masses A, B, C and D of magnitude 200kg, 300kg, 400kg and 200kg respectively and revolving at radii 80mm, 70mm, 60mm and 80mm in planes measured from A at 300mm, 400mm and 700mm. The angles between the cranks measured anticlockwise are A to B 45° , B to C 70° and C to D 120° . The balancing masses are to be placed in planes L and M. The distance between the planes A and L is 100mm, between L and M is 400mm and between M and D is 200mm. If the balancing masses revolve at the radius of 100mm, find their magnitudes and angular positions?
- 5) A 3.6m long shaft carries three pulleys, two at its two ends and the third pulley at the centre. The two end pulleys have masses 79kg and 40kg respectively and their C.G. are 3mm and 5mm from the axis of shaft respectively. The middle pulley has a mass of 50kg and its C.G. is 8mm. The pulleys are so keyed to the shaft at the assembly is in static balance. The shaft rotates at 300rpm in two bearings, 2.4m apart, with equal overhangs on either side. Determine relative angular position of the pulleys and dynamic reaction on the two bearings.

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QUESTION BANK
MODULE 3

- 1) Define the following with respect to governors:
(i) Sensitiveness (ii) Effort (iii) Isochronous (iv) Hunting (v) Controlling Force.
- 2) In a Hartnell governor the length of ball and sleeve arms are 12cm and 10cm respectively. The distance of the fulcrum of the bell crank lever from the governor axis is 14cm. Mass of each governor ball is 4kg. When the governor runs at the mean speed of 300rpm, the ball arm is vertical and sleeve arm is horizontal. For an increase of speed of 4% the sleeve moves 10mm upwards. Neglecting friction, find:
(i) Minimum equilibrium speed, if total sleeve movement is 20mm.
(ii) Spring stiffness.
(iii) Sensitiveness of governor.
(iv) Spring stiffness, if governor is to be isochronous at 300rpm.
- 3) Obtain an expression for speed and height of a porter governor.
- 4) The arms of a porter governor are 300mm long. The upper arms are pivoted on the axis of rotation. The lower arms are attached to the sleeve at the distance of 40mm from the axis of rotation. The mass of load on the sleeve is 70kg and the mass of each ball is 10kg. Determine the equilibrium speed when the radius of rotation of the balls is 200mm. if the friction is equivalent to a load of 20N at the sleeve, what will be the range of speed for this position.
- 5) Analyze the stability of a two wheel vehicle turning left. Derive the necessary equation.
- 6) Find the angle of inclination with respect to the vertical of a 2 wheeler negotiating a turn.
Combined mass of the vehicle with its rider = 250kg
Moment of inertia of the engine flywheel = 0.3kg-m²
Moment of inertia of each road wheel = 1kg-m²
Speed of the engine flywheel is 5 times that of road wheels and that in the same direction.
Height of centre of gravity of rider with vehicle = 0.6m
2 wheeler speed = 90km/hr
Wheel radius = 500mm
Radius of turn = 50mm
- 7) Derive an expression for gyroscopic couple of a rotating disc.
- 8) Derive an expression for stability of four wheel drive moving in a curved path for the effect of gyroscopic couple and for the effect of centrifugal couple.
- 9) With neat sketch, derive the effect of gyroscopic couple on pitching, steering and rolling of a ship.

10) A ship propelled by a turbine rotor which has a mass of 5 tonnes and a speed of 2100 rpm. The rotor has a radius of gyration of 0.5m and rotates in clockwise direction when viewed from the stern. Find the gyroscopic effects in the following conditions:

- (i) The ship sails at a speed of 30km/hr and steers to the left in a curve having 60m radius.
- (ii) The ship pitches 6° above and 6° below the horizontal position. The bow is descending with its maximum velocity. The motion due to pitching is simple harmonic and the periodic time is 20 seconds.
- (iii) The ship rolls and at a certain instant it has an angular velocity of 0.03 rad/s clockwise when viewed from the stern.

Determine also the maximum angular acceleration during pitching.

Explain how the direction of motion due to gyroscopic effect is determined in each case.

11) A rear engine automobile is travelling along a track of 100m mean radius. Each of the four road wheels has a moment of inertia of $2.5\text{kg}\cdot\text{m}^2$ and an effective diameter of 0.6m. The rotating parts of the engine have a moment of inertia of $1.2\text{kg}\cdot\text{m}^2$. The engine axis is parallel to rear axle and the crankshaft rotates in the same sense as the road wheels. The ratio of engine speed to back axle speed is 3:1. The automobile has a mass of 1600kg and its centre of gravity 0.5m above road level. The width of the track of the wheel is 1.5m. Determine the limiting speed of the vehicle around the curve of all four wheels to maintain contact with the road surface.


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QUESTION BANK
MODULE 4

- 1) Define damping coefficient, critical damping coefficient and damping factor
- 2) Define logarithmic decrement and show that it can be expressed as $\delta = 1/n \ln(x_0/x_n)$
- 3) The vibrating system consists of a mass of 50kg and spring stiffness of 30KN/m and is provided with a viscous damper. The damping provided is 20% of critical value. Determine,
 - (i) The damping factor
 - (ii) Natural frequency
 - (iii) Damped angular frequency
 - (iv) Logarithmic decrement
 - (v) Ratio of successive amplitudes.
- 4) A body of mass 2kg is suspended on a spring of stiffness 2KN/m and has a dashpot connected to it which produces a resistance of 3N at a velocity of 3m/sec. find the logarithmic decrement, in what ratio will the amplitude of vibration can be reduced after 5cycles.
- 5) A machine of 20kg mass is mounted on the spring of stiffness 17KN/m and a damper with damping coefficient $C=300\text{N-sec/m}$. Determine the displacement of the mass after 1sec with the following initial conditions,
 - (i) $x(0) = 25\text{mm}$, $\dot{x} = 0$
 - (ii) $x(0) = 0$, $\dot{x} = 300\text{m/sec}$
- 6) Define the following:
 - (i) Vibrations (ii) Simple harmonic motion (iii) Periodic motion (iv) Degrees of freedom
 - (v) Time Period
- 7) Add the following harmonic motions and check the solution graphically:
 $x_1 = 2\cos(\omega t + 0.5)$
 $x_2 = 5\sin(\omega t + 1.0)$
- 8) Differentiate between the following:
 - (i) Free and forced vibration (ii) Damped and Undamped vibration (iii) Deterministic and random vibration. (iv) Linear and nonlinear vibrations.
- 9) A harmonic motion has a frequency of 10HZ and its maximum velocity is 2.5m/sec. determine its amplitude, period and maximum acceleration
- 10) Explain vector method of representation of harmonic motion
- 11) Derive the differential equation of damped free vibration for an under damped condition.


6. With a neat sketch, explain the principle of flowing film concentration. (10 Marks)
7. With a neat sketch, explain the concept of floatation. (10 Marks)
8. With a neat sketch, explain the working principle of Jigging. (08 Marks)
9. With a neat sketch, explain the working of shaking table. (08 Marks)
10. With neat sketch, explain the working principle of wilfly table. (08 Marks)


MODULE-IV

1. With graphs, explain the construction of washability curve. (08 Marks)
2. With a neat sketch, explain the working of thickener. (08 Marks)
3. With a neat sketch, explain the working of drying. (08 Marks)
4. Draw the general beneficiation flow chart of lime stone and explain the same. (08 Marks)
5. Write the Procedure for float & sink test. (08 Marks)
6. Write notes on washability curves uses and application. (08 Marks)
7. With a neat sketch, explain the working of continuous thickener. (10 Marks)
8. Draw the flow chart of iron ore and explain. (10 Marks)
9. Write a note on float and sink test with neat sketch. (10 Marks)
10. Explain use of float and sink test. Write a note on construction of washability curves. (10 Marks)
11. Write a note on interpretation of tramp curves near gravity material with a neat sketch. (10 Marks)
12. Define washability index of coal. Write a note on washability index of coal. (10 Marks)
13. With a neat sketch, explain the working of drying. (08 Marks)
14. Draw the general beneficiation flow chart of lime stone and explain the same. (08 Marks)

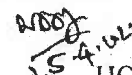
MODULE-V

1. Briefly explain about the characteristics of Indian coal. (08 Marks)
2. With neat sketch, explain the manufacture, reactions and uses of water gas. (08 Marks)
3. Explain in detail about the combustion stoichiometry. (08 Marks)
4. Explain low and high temperature carbonization. (08 Marks)
5. Explain the different types of fuels giving each fuel example. (08 Marks)
6. Write the caking and coking properties of coal. (08 Marks)
7. Explain the different sources of gas occurrence and uses. (08 Marks)
8. Write note on mechanism of coal combustion and mention on high temperature combustion. (08 Marks)
9. Define liquefaction. Write a note on gasification of solid fuels. (10 Marks)
10. Define fuel. Briefly explain classification of fuels with examples. (10 Marks)
11. Define coal. Write a note on classification of coal based on grade. (10 Marks)
12. Define the following: i) Calorific value of coal ii) Coking coal iii) Non-coking coal. iv) Calorific value of Anthracites, Bituminous, Lignite. (10 Marks)
13. Write a note on "LURGI-SPILL PROCESS" of carbonization of coal. (10 Marks)
14. Define combustion of coal. Briefly explain mechanism of coal combustion. (10 Marks)
15. Define crude oil. Write a note on classification of petroleum. (10 Marks)
16. Define natural gas. List out the different petroleum products. (10 Marks)
17. Discuss in detail about wood. (08 Marks)
18. Discuss in detail about lignite. (08 Marks)


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Course Instructor


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COMPUTER SCIENCE AND ENGINEERING

3rd Semester

Subject Name: Discrete Mathematical Structures

Subject code: 18CS36

Question Bank

Module1

1. Define the following with an example for each: (i) Proposition (ii) Tautology (iii) Contradiction (iv) Duality principle

2. Justify the following using laws of logic:

$$(p \rightarrow q) \wedge [\neg q \wedge (r \vee \neg q)] \text{ equivalent to } \neg(q \vee p)$$

3. Determine the truth value for the following, if p, q, r have the 0, 0 and 1 as truth values:

$$p \rightarrow (q \wedge r)$$

$$p \rightarrow (q \rightarrow \neg r)$$

4. Show that

$$i) \{(p \vee q) \rightarrow r\} \leftrightarrow \{\neg r \rightarrow \neg(p \vee q)\} \text{ is tautology or contradiction}$$

5. Prove using laws of logic

$$p \rightarrow (q \rightarrow r) \text{ biconditional } (p \wedge q) \rightarrow r$$

$$p \rightarrow (q \wedge r) \text{ biconditional } (p \rightarrow q) \wedge (p \rightarrow r)$$

6. Test the validity of the foll:

$$(p \rightarrow q) \wedge (q \rightarrow (r \wedge s)) \wedge (\neg r \rightarrow (\neg t \vee u)) \wedge (p \wedge t) \text{ therefore } u$$

7. Prove if k and l are odd numbers, then k+l is even

8. Explain Quantifiers and open statement with example

9. Using Inference rules, prove the following

$$\text{For all } x, (p(x) \vee q(x))$$

$$\text{For all } x, (\neg q(x) \vee r(x))$$

$$\text{For all } x, (s(x) \rightarrow \neg r(x))$$

$$\text{There exists, } \neg p(x) \text{ therefore there exists, } \neg s(x)$$

10. Define dual of a logical statement. Verify the principle of duality for,

$$[\neg(p \wedge q) \rightarrow \neg p \vee (\neg p \vee q)] \text{ equivalent to } (\neg p \vee q)$$

11. Show that $(p \vee q) \wedge \{(p \rightarrow r) \wedge (q \rightarrow r)\} \rightarrow r$ is tautology or contradiction

12. Test the validity of the foll:

$$((\neg p \vee q) \rightarrow r) \wedge (\neg s \wedge \neg u) \wedge (r \rightarrow (s \vee t)) \wedge (\neg u \rightarrow \neg t)$$

therefore p

13. Find the negation of the following quantified statement,

$$(i) \quad x, y, [p(x,y) \wedge q(x,y)] \rightarrow r(x,y)$$

$$(ii) \quad x, y, [(x < y) \rightarrow ((x-y) > 0)]$$

14. Find whether the following arguments are valid or not for which the universe is set of all triangles. In triangle XYZ, there is no pair of angles of equal measure. If the triangle has 2 sides of equal length, then it is isosceles. If the triangle is isosceles, then it has 2 angles of equal measure. Therefore XYZ has no 2 sides of equal length.

15. Prove that for all integers 'k' and 'l', if 'k' and 'l' are both odd, then 'k+l' is even and kl is odd by direct proof.

Module 2

1. Prove by Mathematical Induction that, for every positive integer n, 5 divides $n^5 - n$.

2. Prove by Mathematical Induction that, for every positive integer n,
 $1^2 + 2^2 + \dots + (2n-1)^2 = (n(2n+1)(2n-1)) / 3$

3. State the Induction principle. Prove by Induction method that, $6^{n+2} + 7^{2n+1}$ is divisible by 43 for each positive integer n.

4. Prove by Mathematical Induction that, for every positive integer n,
 $1 + 2 + \dots + n = \frac{1}{2}n(n+1)$

5. Solve the sequence defined recursively by

$a_1=4, a_n = a_{n-1} + n$ for $n \geq 2$ and find a_n in explicit form.

5. A sequence $\{C_n\}$ is defined recursively by $C_n = 3C_{n-1} - 2C_{n-2}$ for all $n \geq 3$, with $C_1=5$ & $C_2=3$ as the initial conditions. Show that $C_n = -2^n + 7$

6. The Ackermanns numbers $A_{m,n}$, defined recursively for $m, n \in \mathbb{N}$ as follows:

$A_{0,n} = n+1$ for $n \geq 0$
 for $m > 0$
 $A_{m,n} = A_{m-1,p}$ where $p = A_{m,n-1}$, for $m, n > 0$.

Prove that $A_{1,n} = n+2$ for all $n \in \mathbb{N}$

7. If F_i 's are Fibonacci numbers and L_i 's are Lucas numbers,

Justify $L_{n+4} - L_n = 5F_{n+2}$ for all integers $n \geq 0$.

8. Find the number of arrangements of all letters in TALLAHASSEE. How many of these arrangements have no adjacent A's?

9. Solve and find the coefficient of $x^{11}y^4$ in the expansion of $(2x^3 - 3xy^2 + z^2)^6$

10. i) How many arrangements are there for all letters in the word SOCIOLOGICAL?

ii) In how many arrangements A & G are adjacent?

iii) In how many of these arrangements all the vowels are adjacent?

11. Solve and find the sum of all the coefficients in the expansion of $(x+y)^n$ and obtain sum of all coefficients in the expansion $(x+y)^{10}$

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Module 3

1. Define Function and explain its types with example each
2. Let $A = \{1,2,3\}$ and $B = \{2,4,5,7\}$
number of relations from A to B that contain (1,4) and (1,5) (i) Find the
on A that contain at least 7 ordered pairs (ii) Find the number of relations
3. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \begin{cases} 3x - 5 & \text{for } x > 0 \\ -3x + 1 & \text{for } x \leq 0 \end{cases}$ Solve $f(5/3)$, $f(-5/3)$, $f^{-1}(1)$, $f^{-1}(-3)$, $f^{-1}(-6)$, $f^{-1}([-5,5])$
4. The functions $f : \mathbb{R} \rightarrow \mathbb{R}$ and $g : \mathbb{R} \rightarrow \mathbb{R}$ are defined by $f(x) = 3x + 7$ for all $x \in \mathbb{R}$, and $g(x) = x(x^3 - 1)$ for all $x \in \mathbb{R}$. Verify that f is one to one but g is not.
5. Let f, g, h be the function form \mathbb{R} to \mathbb{R} defined by $f(x) = x+2$, $g(x) = x-2$, $h(x) = 3x$ for all $x \in \mathbb{R}$. Solve $g \circ f$, $f \circ g$, $f \circ f$, $h \circ g$, $f \circ h$.
6. Let $A = \{a, b, c, d, e\}$. Consider the partition $P = \{\{a, b\}, \{c, d\}, \{e\}\}$ of A. Solve and give the Equivalence relation which induces this partition.
7. Let $A = \{1,2,3,4\}$, f and g be functions from A to A given by,
 $f = \{(1,4), (2,1), (3,2), (4,3)\}$ $g = \{(1,2), (2,3), (3,4), (4,1)\}$ Prove that f and g are inverses of each other.
8. Let $A = \{1,2,3,4,6,12\}$ on A. define the relation R by $a R b$ iff 'a' divides 'b'
i. Prove that R is a partial order on A
ii. Draw the Hasse diagram
iii. Write the matrix of relation
9. Define lattice. Assume an example of an Hasse diagram, Consider sub graph, $B = \{3,4,5\}$. Find the POSET elements and also check whether it is lattice.
10. Let S be the set of all non-zero integers and $A = S * S$ on A, define the relation R by $(a,b) R (c,d)$ if and only if $ad=bc$. Show that R is an equivalence relation.
11. Draw the hasse diagram representing the positive divisors of 36
12. If $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2$. Determine whether f is invertible and if, determine f.
13. Define the relation R for two lines l_1, l_2 that is $l_1 R l_2$ if l_1 is perpendicular to l_2 . Determine whether the relation is reflexive, symmetric, antisymmetric or transitive

Module 4

1. Determine the number of positive integers n where $1 \leq n \leq 100$ and n is not divisible by 2, 3 or 5
2. How many dearrangements are there for 1, 2, 3, 4 and 5?
3. Solve the recurrence relation $b_n = b D_{n-1} - b^2 D_{n-2}$, $n \geq 3$ given $D_1 = b > 0$ and $D_2 = 0$
4. In how many ways can the 26 letters of the alphabet be permuted so that none of the patterns car, dog, pun or byte occurs?
5. Find the root polynomial for 3*3 board using the expansion formula
6. The number of bacteria in a culture is 1000 and this number increases 250 degree every two hours. Use a recurrence relation to determine the number of bacteria present after one day.
7. In how many ways can we arrange the letters in the correspondents so that,
 - i) there is no pair of consecutive identical letters?
 - ii) there are exactly two pairs of consecutive identical letters.
 - iii) There are atleast 3 pairs of consecutive identical letters
8. Find the recurrence relation and the initial conditions for the sequence 0, 2, 6, 12, 20, 30, 42, ... hence find the general term of the sequence.
9. Find the general solution of the equation $S(k) + 3S(k-1) - 4S(k-2) = 4^k$
10. A girl student has sarees of 5 different colors blue, green, red, white and yellow. On Monday she does not wear green, on Tuesdays blue or red, on Wednesday blue or green. On Thursday red or yellow, on Friday red. In how many ways can she dress without repeating a color during a week.
11. An apple, banana, mango and an orange are to be distributed to 4 boys B1, B2, B3, B4. The boys B1 and B2 do not wish to have apple, the boy B3 does not want banana or mango and B4 refuses orange. In how many ways the distribution can be made so that no boy is displeased?
12. Solve the recurrence relation $a_n = 3a_{n-1} - 2a_{n-2}$ for $n \geq 2$ given that $a_1 = 5$ and $a_2 = 3$
13. Solve the recurrence relation $a_n - 3a_{n-1} = 5 \cdot 3^n$ for $n \geq 1$ given that $a_0 = 2$
14. Let a_n denote the number of n -letter sequences that can be formed using the letters A, B and C such that non terminal A has to be immediately followed by a B. Find the recurrence relation for a_n and solve it.
15. Solve the recurrence relation:
 $a_n + a_{n-1} - 6a_{n-2} = 0$, $n \geq 2$, given $a_0 = -1$ and $a_1 = 8$

Module 5

1. Define complete graph, general graph and bipartite graph with example for each.
2. Apply the merge sort to the following given list of elements and sort the elements: $\{-1, 0, 2, -2, 3, 6, -3, 5, 1, 4\}$
3. Let $G = G(V,E)$ be a simple graph with m edges and n vertices. Justify the following:
 - i. for a complete graph K_n , $m = (1/2) n (n-1)$ edges
 - ii. How many vertices and edges are there in $K_{7, 11}$
4. Obtain an optimal prefix code for the message ROAD IS GOOD, Indicate the code and weight
5. Define Euler circuit and Euler Trail. Give example for each
6. Define Isomorphism. Justify any two graphs are Isomorphic to each other
7. Construct an optimal prefix code for the symbols a, b, c, d, e, f, g, h, i, j that occur with respective frequencies 78,16,30,35,125,31,20,50,80,3
8. Consider any tree, list the vertices according to a preorder and a postorder traversal.
9. Let $G=(V,E)$ be a connected undirected graph. What is the largest possible value for $|V|$ if $|E| = 19$ and $\deg(v) \geq 4$ for all $v \in V$?
10. For every tree $T=(V,E)$ if $|V| \geq 2$. Then prove that T has atleast two pendant vertices


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