G037+G038+G039 Exercises

(1)Voltage and power relationship

Slide 1 to 2

1. Find the sending end voltage if the receiving end voltage is 2000V. Active power is 1500 watt, reactive power is 700VAR. Inductive reactance is 10 ohm.

Slide 3 to 6

2.Calculate the voltage, active & reactive power of sending end.

Slide 7 to 8

3. Why is insulation required.

4.outline the factors that deteoriate the insulation.

Slide 9

5.What actions are required for protecting the insulation from external impacts.?

6.Sketch the waveform of lightning strike.

Slide 10+11

7.What are the main objectives of site earthing?

8.Explain touch voltage, step voltage and mesh voltage.

Slide 12 to 14

9.Explain the followings

(a) Coupling (b) Lightning protection (c) Surge protector.

Slide 15

10.What are the disadvantages of poor power factor?

11.Explain harmonic

Slide 16+17

12.Sketch how the interference can be coupled in to electrical system.

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(2) Power system control equipments

Slide 1

13.Sketch power supply busbar system.

Slide 2+3

14.Explain (a) Booster (b) Basic insulation level

Slide 4

15.Describe the substation equipments & substation operation

Slide 5

16.What are the electric arc extinguishing methods?

Slide 6+7

17.Explain ground resistance and soil resistivity.

Slide 8

18.Explain the types of protection system in substation.

Slide 9

19.What is wide area monitoring and control system?

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(3) Harmonic

Slide 1+2

20.The current in a system is 70A in which 60 amp is fundamental. Calculate total harmonic distortion . If the harmonic is combination of 3^{rd} , 5^{th} and 7^{th} and third harmonic is 16A, 5^{th} harmonic is 12A, find 7^{th} harmonic.

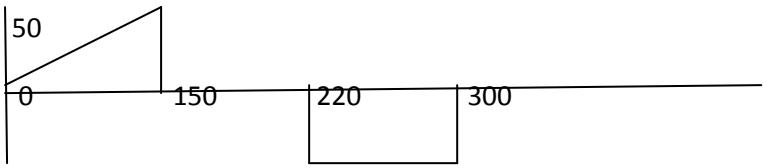
Slide 3+4

21.The given figure shows a deteoriated voltage source which composes of a fundamental of 100V, 60HZ and a 5^{th} harmonic of 65V. The source is connected to a resistor of 27 ohm in series with an inductance of 20mH. Calculate (a) Total impedance of fundamental (b) Fundamental current (c)

Active and reactive power at fundamental (d) Total impedance of 5^{th} harmonic (e)5^{th} harmonic (f) Active and reactive power at 5^{th} harmonic.

Slide 5+6

22. Analyze the following harmonic wave.



Slide 7+8+9

23.Write the equation to calculate the power of synchronous generator.

24.Sketch leading and lagging power factor vector diagram.

Slide 10+11

25.Write the equation that relates to angular acceleration and transfer of power and load power change.

Slide 12 to 14

26.Sketch the block diagram of governor control for (a) Turning the generator connected to a power system (b) Two power systems interconnected by a tie line.

Slide 17 to 21

28.The power system A & B each has a regulation R1 of 0.1 pu on respective capacity base and a stiffness U of 1 pu. The capacity of system (a0 is 1500MW and B 1000MW. The systems are interconnected through a tie line and are initially at 60HZ if there is 100MW load change in the steady state value of frequency and power transformer.

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(4) Power Line Earthing

Slide 1

29.What is objective of earthing?

Slide 2

30.Describe the categories of earthing

31.Sketch the earthing of generator and switch board.

Slide 3

32.Sketch earthing of coaxial cable and two separately earthing.

Slide 4+5

33.Sketch earth bonding

Slide 6

34.Describe the types of insulators.

35.Explain insulator dielectric behaviour

Slide 7

36.Explain the testing of insulator

Slide 8+9

37.What are the sources of over voltage?

Slide 10

38.Sketch the lightning arrester.

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(5) Power Line

Slide 3+4

39.What are the major items in most industrial and commercial plants?

Slide 5

40.What are the factors related to power system reliability?

Slide 6+7

41.Sketch (a) Tap changer (b) Load control (c) Booster (d) Synchronous motor connected to busbar (e)Power triangle & excitation & power factor graph of synchronous motor

Slide 8 to 10

42.Sketch over current relay and circuit breaker

Slide 11+12

43.Explain electric arc extinguishing methods

44. Sketch the electric arc.

Slide 13

45.Explain the co-ordination of protective relaying

Slide 14

46.What are the sources of electrical interference?

Slide 15

47.What are the harmonic reduction methods?

Slide 16

48.Explain the interference

Slide 17

49.Write the formula to calculate peak lightning voltage

Slide 18+19

50.What are the requirements to withstand the lightning strike?

Slide 20

51.What are the impacts of transient over voltage?

Slide 21

52.What are the power system faults?

Slide 22 to 27

53.What are the sources of harmonic?

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(6) Signal coupling ,earthing and power quality

Slide 1

54.Explain the methods to reduce the effective of coupling in signal and control cable

Slide 2 to 8

55.Explain the surges protection zones with sketch.

Slide 5 to 7

56.Sketch the connection of earthing conductor.

Slide 8 to 10

57.Explain the surge protection unit with sketch and express their location.

Slide 11+12

58.Explain power line conditioner with sketch.

Slide 13 to 16

59.explain (a0 soil resistivity (b) Earth resistance measurement

Slide 17+18

60.What are the factors that earth resistance depends on?

Slide 25 to 27

61.Explain (a0 Interruption (b) Sag (Dip) (c) Swell

Slide 28+29

62.Define power quality

63.Explain the causes of disturbances in power system.

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(7) Power Quality

Slide 1+2

64.What are the main phenomena causing electro-magnetic and power quality disturbance?

Slide 3

65.explain transient

Slide 4

66.Explain voltage imbalance and waveform distortion

Slide 5

67.What is notching

Slide 6

68.Explain power frequency variation and write the formula to calculate ripple factor and total harmonic distortion.

Slide 7

69.What problems can be caused by poor power quality?

Slide 8

70.How can power quality be improved?

Slide 9

71.What are the power quality problems in synchronous machine?

Slide 10+11

72.Write the electrical equation for synchronous machine.

Slide 12+13

73.Explain the power quality of wind turbine alternator

Slide 14 to 16

74.Model harmonic in synchronous machine.

Slide 17

75.draw the harmonic equivalent circuit of synchronous machine.

Slide 18 to 21

76.Sketch the harmonic model of generator excitation system

Slide 24

77.What are the disadvantages of harmonic?

Slide 25 to 27

78.Sketch the equivalent circuit of induction motor and harmonic model of it.

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(8) Harmonic losses in transformer

Slide 1

79.Explain (a) Skin effect (b) Hysteresis and eddy current losses (c) Proximity effect.

Slide 2

80.Explain the derating of transformer

81.What are the modes of operation of electrical machines?

Slide 3 to 5

82.Describe harmonic filtering.

Slide 6

83.Explain (a) Voltage increase (b)reactive power compensation

Slide 7 to 16

84.Explain the followings with necessary sketches

(a)Role of filters in power system (b) Power filter (c) Active filter (d) Hybrid filter(e) Series filter (f) Shunt filter

Slide 17 to 19

85.Explain the reliability improvement methods in power system

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(9) Preparation for emergency

Slide 1 to 3

86. Explain (a) Preparation for emergency (b)Demand management (c) Distributed control

Slide 4+5

87.A square wave has an amplitude of 70V. The amplitude of fundamental s 86V , calculate (a)the effective value of source wave (b) the effective value of fundamental (c) the effective value of all harmonic.

Slide 5+6+7

88.The circuit consists of 100 V 60HZ and 51V 300HZ in series with 24 ohm resistor & 18.6 mH inductor. Calculate (a) Impedance at 60HZ (b) Active 7 reactive power absorbed by resistor & inductor (c) Total dissipated power.

Slide 8+9+10

89.A distorted voltage is connected across the terminals of a coil having 1000 turns. The voltage has a fundamental component of 150V, 60HZ and a third harmonic of 110V , 180HZ. The harmonic lags 145 degree behind the fundamental. Calculate (a) total voltage (b) Fundamental flux (c0 Third harmonic flux.

Slide 11-16

90.The primary winding of a transformer carries a distorted current having the following components.

Fundamental = 530A

Third harmonic = 290A

23^{rd} harmonic = 49A

The winding has a DC resistance of 4 mΩ and stray losses are equal to 5% of total joule effect losses. Calculate (a) The effective value of total current (b) K factor (c) The joules effect losses in primary winding (d) The stray losses and total losses in the primary winding (e) The component in total current which produces the largest Joules effect losses (f) The component of total current that produces the largest stray loss.

Slide 18 to 20.

91. A 35 MVA , 11 KV , 60HZ AC generator has a synchronous reactance of 1.5 pu and AC resistance of 0.025 pu.

Calculate (a) the base voltage, base power and base impedance of the generator

(b)the actual value of synchronous reactance (c) the actual winding resistance per phase (d) the total full load copper losses.

Slide 21 to 23

92.A 38MVA, 22.8 KV, three phase alternator has a synchronous reactance of 9 Ω and a nominal current 1 KA. The no load saturation curve shows Ef. If the excitation for terminal voltage is fixed at 21KV, calculate the exciting current required and draw the phasor diagram for the following conditions.

(a) No load (b) Resistive load of 36MW (c) Capacitive load of 12 MVAR

Slide 24

93.A 37 MVAR , 22 KV 1800 RPM three phase alternator connected to a power grid has a synchronous reactance of 5 Ω per phase . If the exciting voltage is 11KV (Line to neutral) and the system voltage is 18KV (Line to line), calculate the followings

(a)The active power that the machine delivers when the torque angle is 20 degree. (b) The maximum power that the machine can delivers before it falls out to stop.

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(10) Steam turbine

Slide 1 to 3

94.A 250 MVA , 25 KV three phase steam turbine generator has a synchronous reactance 1.6pu and a transient reactance Xd ' of 0.23 pu , it delivers it's rated output at a power factor of 100%. A short circuit suddenly occurs on the line close to generator station.

Calculate (a) Base impedance (b) Rated voltage drop (c) Transient reactance (d) Initial short circuit current (e)Steady state value of short circuit current.

Slide 4+5

95. An isolated 75MVA synchronous generator feeds it's own load and operates initially at no load at 3000 RPM, 50HZ. A 20 MW load is suddenly applied and the steam valve to the turbine commence to open after 0.5 sec due to the time lag in the governor system. Calculate the frequency to which the generated voltage drops before the steam flow meets the new load. The stored energy for the machine is 4KW – S- per KVA of generator capacity

Slide 6

96. Two units of generator maintain 65KV and 60KV line at the end of an interconnector of inductive reactance per phase of 50 ohm with negligible resistance and shunt capacitance . A load of 14 MW is to be transferred from 65KV unit to the other end. Calculate the necessary condition between two ends including PF of the current transmitted.

Slide 7

97.Draw the governor control system

Slide 8 to 13

98.Explain the methods of voltage control with sketch.

Slide 14

99.Explain digital field excitation system

Slide 15 to 22

100. Describe the followings

(a) Steam turbine system (b) Hydro-electric system (c) Computer control (d)Main feeder (e) Re-closer (f) Load balancing (g)Booster (h) Sectionalization.

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(11) Power System Protection

Slide 1 to 7

101. Explain

(a) Over current relay (b) Distance relay (c) Differential relay

Slide 8 + 9

102.Describe distribution transformer & rating

Slide 10

103.Describe the substation equipments.

104.Explain (a) insulator 9b0 pole strength (c)equipments for line construction (d) distribution transformer (e) UG Transformer

105.Describe the rating of transformer.

106.Explain (a) Revenue meter (b)Power factor (c)Demand control

Slide 11

107.What are the important factors of protective switch gear?

Slide 12

108.How can the arc resistance be increased?

Slide 13

109.describe OCB with sketch

Slide 14+15

110.Sketch the connection of instrument transformer.

111.Explain voltage regulator.

Slide 16+17

112 What is the need for electrical protection?

113.explain ACB, OCB, Vacuum Circuit breakers & protection system.

E046

(1)Motion along straight line

Slide 1+2+3

1.The car is driven along a straight road for 18.4 Km at 60 Km/ hr. At which point the truck runs off the gasoline & stops. The next 20 minutes, the driver walks along the road for another 3 Km.
(a) What is over all displacement?

(b)What is time interval from the beginning of the drive to arrival at the station?

(c)What is average velocity?

Slide 4 to 8

2.The following equations give the position X(t) of a particle in four situation.
(a) $X = 8t - 2$ (b) $X = -9t^2-2$ (c) $x = 1/ 2t^2$ (d) $x = -3$

Slide 9+10

3.The following equations give the position X (t) of a particle in four situations
(a) $X = 8t-4$ (b) $x= -6t^3+9t^2+6$ (c) $X = 3 / t^2 - 9/ t$ (d) $X = 7 t^2-4$ To which of these situations? Do the constant acceleration formulae apply?

Slide 11

4.The head of a wood pecker is moving forward at the speed of 9m/ s .When the peck makes first contact with a tree limb, the peck stops after penetrating the limb by 2 mm. Assuming the acceleration to be constant, find the acceleration magnitude.

Slide 12+13

5.A pitcher tosses a base ball up along Y axis with initial velocity 14 m/s. (a) How long does the ball take to reach it's maximum height? (b) What is the maximum height above it's release point? (c) How long does the ball take to reach a point 5 m above it's release point?

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(2) Vector

Slide 1 to 4

6.The magnitude of $\vec{a}$ is 3 Km due East and $\vec{b}$ = 5 Km North of East. $\vec{c}$ = 1 Km due West. What is the greatest distance at third displacement?

Slide 5

8.A small air plane leaves an airport on over cast day & is later sighted 280 km away in a direction making an angle of 25 degree East due North. How far East & North is the airplane from the airport sighted?

Slide 6

9. $\vec{a}$ = 3 I – 8 j $\vec{b}$ = -2 I + 4 j $\vec{c}$ = - 4 j

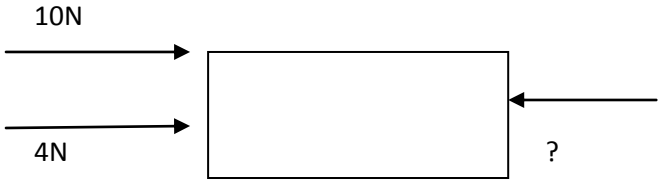
Find the resultant vector.

Slide 7 to 12

10. $\vec{a}$ = 4 I + 5 j + 7k $\vec{b}$ = 3 I + j + 4 k Find $\vec{a}$. $\vec{b}$ and $\vec{a}$ x $\vec{b}$

Slide 13

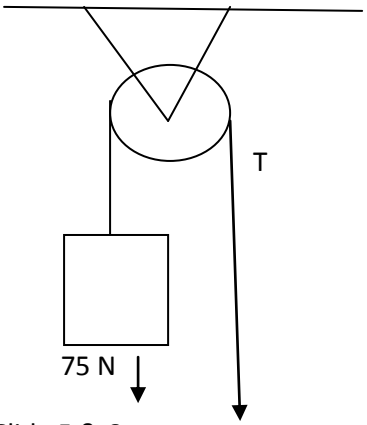
11.The figure shows two horizontal forces acting on the block. What is the third force when the block is stationary. The block is moving to the right at constant speed of 6 m/ s?



Mass= 10 kg

(3) Force/ acceleration

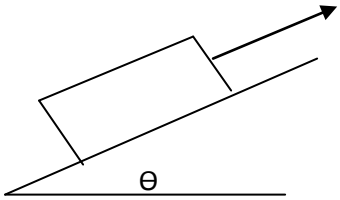
Slide 1 to 4



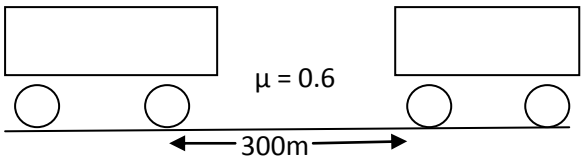
Is T equal to (or) greater than (or) less than 75N when the body Is moving upward (a) At constant speed? (b) At increased speed (c) At decreasing speed?

Slide 5 & 6

12. Cord A cord pulls on a box up along a frictionless plane inclined at Θ = 20 degree. The box has mass m = 10 kg The speed from the cord has magnitude T = 30N. What is acceleration of the box?



13.



The car was stopped after having moved 300m when the brake was applied. What is the initial and fractional force if the mass is 400 Kg.

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(4) Circular Motion

Slide 1+2

14.The circus performer is riding a bicycle in the loop with radius R = 2.7 m. What is the least speed at the top of the loop and the force. Mass = 20 kg.

Slide 3 to 7

15.Suppose that the coefficient of static friction μ between the rider's clothing and the canvas is 0.4 and the cylinder radius " R" is 2.1 m.

(a) What minimum speed (V) must the cylinder and the rider have if the rider is not to fall when the floor drops? (b) If the rider's mass is 49 Kg, what is the magnitude of centrifugal force on rider?

16. If a falling cat reaches a first terminal speed of 97 Km/ hr while it is tucked in and then stretches out, doubling A, how fast is it falling when it reaches a new terminal speed?

17. A rain drop with radius R = 1.5 mm falls from a cloud that is at height h = 1200 m above the ground. The drag coefficient C for the drop is 0.6. Assume that the drop is spherical throughout its fall. The density of water ρ_w is 1000 kg / m^3 . The density of ρ_a is 1.2 kg/ m^3 . What is terminal speed of the drop?

Slide 8+9

18. A astronaut on international space station in circular orbit around the Earth at altitude 520 km. constant speed V = 7.6 km/s. Mass is 79 kg. Find acceleration.

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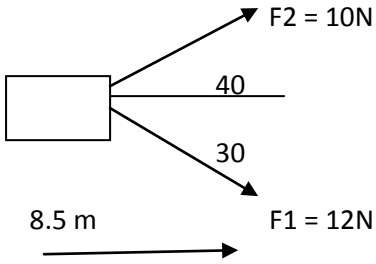
(5) Energy

Slide 1

19. A locomotive is moving at 0.26 m/ s^2 acceleration and it is weighed 1.2 x 10^6 N. What is kinetic energy? It moves for 3.2 Km.

Slide 2+3+4

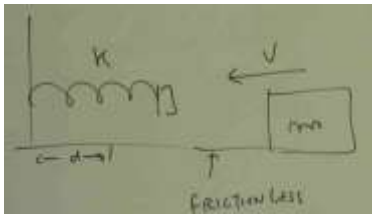
20.



Find total work done of the forces.

21. The work done is 153.4 J. Mass is 225 Kg. Calculate velocity.

22.A mass 0.4 Kg slides across a horizontal frictionless counter with speed V = 0.5 m/s . It then runs and compresses a spring of spring constant K = 750 N / m . Calculate the distance the spring compressed.



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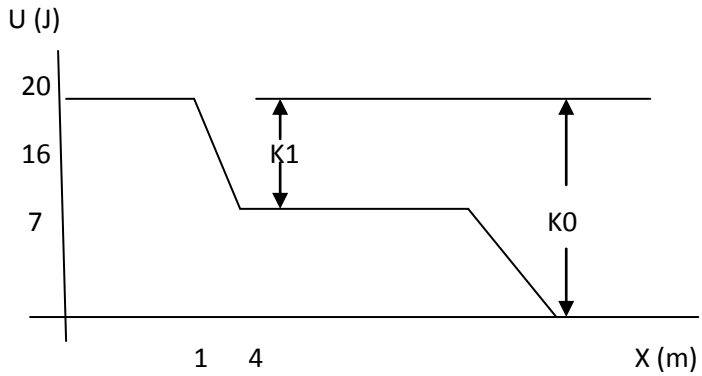

Calculate the force for given energy change.

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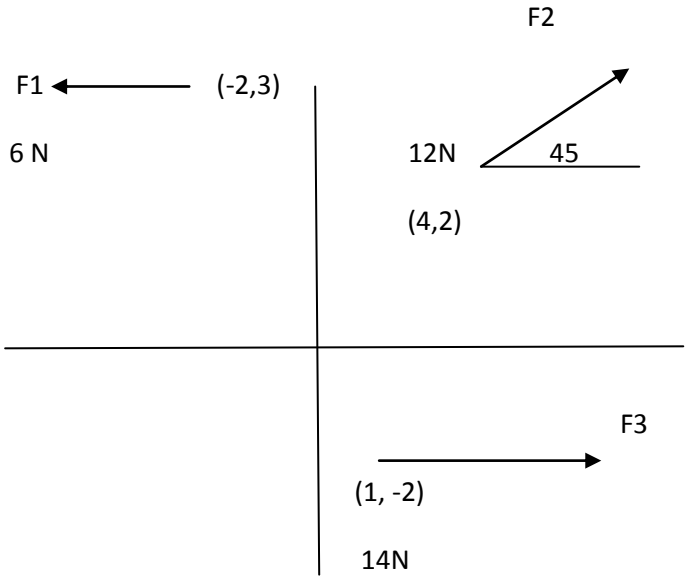
(6) Centre of mass and linear momentum

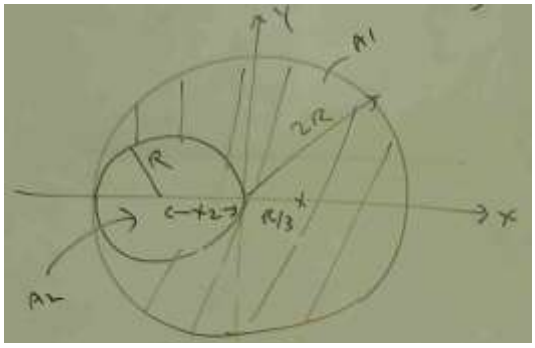
Slide 1 to 6

24. Three particles in the figure are initially at rest. Each experience the external force due to bodies outside the three particle system. The directions are indicated and the magnitudes are F 1= 6N , F 2= 12N and F3 = 14N. What is the acceleration of the centre of mass & the direction?



25. Three particles of masses m 1 = 1,2 Kg, m2 = 2.5 Kg and m3 = 3.4 kg form an equilateral triangle of edge length a = 140 cm. Where is the centre of mass of this system?

26. The figure shows a uniform metal plate " P " of radius " 2 R " from which a disk of radius "R" has been stamped out. Using the X-Y co-ordinate system shown, locate the centre of mass of the plate.



Slide 7 to 11

27. The angular position Θ(t) of a reference line on the disk is given by $\Theta = -1 - 0.6t + 0.25\ t^2$

(a) Graph the angular position of the disk versus time (-3 to 5.4 sec)

(b) At what time does Θ(t) reach minimum value? What is the minimum value?

28. A grind stone rotates at a constant angular acceleration α = 0.85 rad/ s^2 . At time t = 0 , it has angular velocity w0 = -4.6 rad/ s and a reference line on it is horizontal at the angular position $\Theta_0 = a$

(a) At what time after t= 0 is the reference line at angular position Θ = 5 rev

(b) Describe the rotation between t= 0 and t = 32 sec.

(c) At what time t, does the grind stone momentarily stop?

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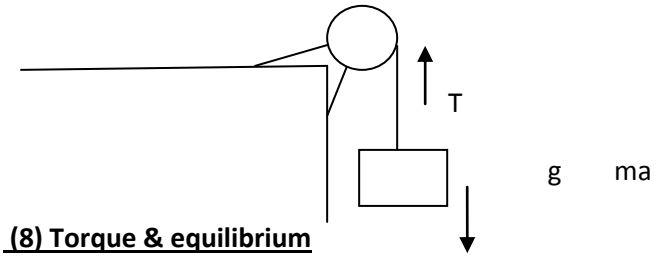
(7)Linear & angular variable

Slide 2 to 5

29. A coach roach rides the rim of a rotating merry go around. If the angular speed is constant, does the coach roach have (a) Radial acceleration ? (b) Tangential acceleration ? What angle Θ_p should the arc subtend so that a 15. 4 kg at the point "P".

Slide 6 to 10

30.Figure shows a uniform disk with mass M = 2.5 kg, R = 20 cm. A block of m = 1.2 kg hangs from a massless cord. Find acceleration of falling block.



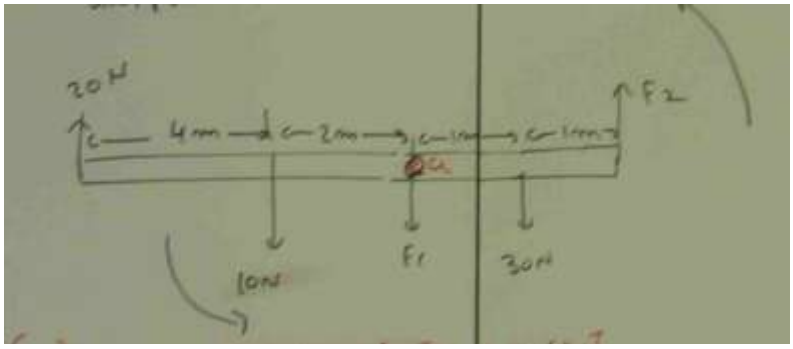
(8) Torque & equilibrium

Slide 1

29. A rolling object has linear velocity 342.5 m/s radius =3 m mass =170 kg Calculate total kinetic energy.

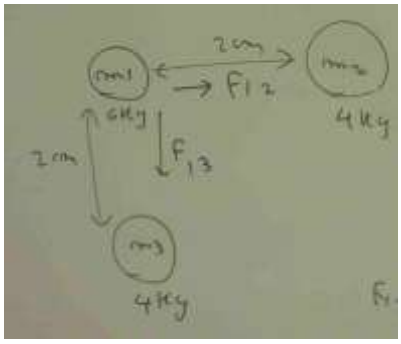
Slide 2

30.The figure gives overview of a uniform rod in static equilibrium (a) can you find the magnitude of uniform forces F1 & F2.



Slide 4

31.M 1=6 Kg, M2= 4 kg d = 2 cm. Find F net on particle 1 due to other particles.

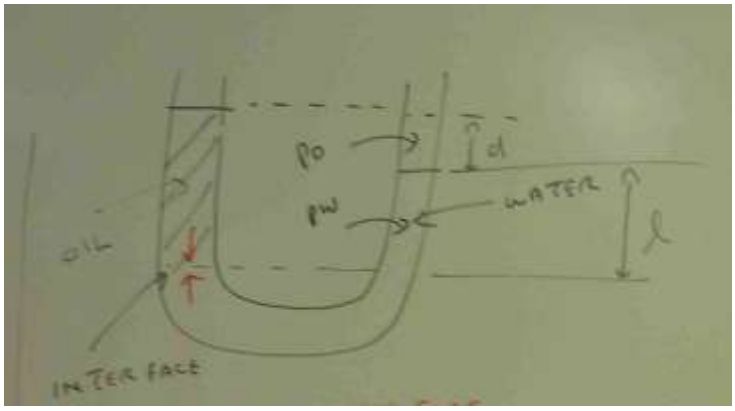


Slide 5 to 11

32.A living room has the floor dimension and height of 3 m (a) What does the air in the room weigh when the air pressure is 1 atm? (b) What is the magnitude of the atmosphere downward force on the top of your head which we take to have an area of 0.04m^2

33. The U tube in figure contains two liquids in static equilibrium density of water is 993 kg / m^3 l = 135 mm, d = 12.3 mm

What is the density of oil?



34.Explain (a)Archimedes's principle (b) Bernaullis' equation

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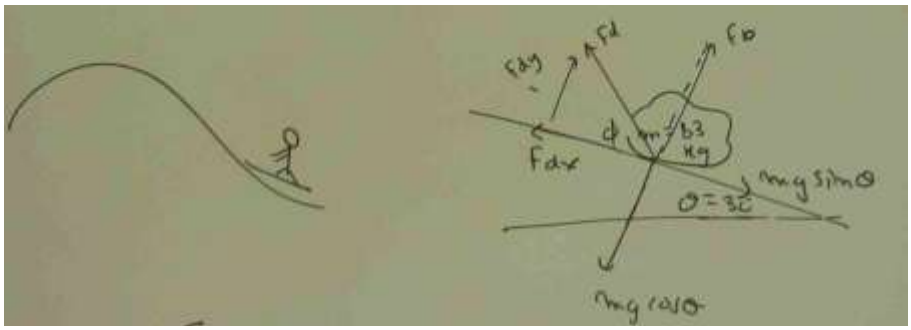
(9) Fluid

Slide 1

31.The diagram shows how the stream of water emerging from a faucet neck down as it falls. The indicated cross sectional areas are A o = 1.2 cm^2 and A = 0.35 cm^2 . The two levels are separated by a vertical distance h= 45 mm. What is the volume flow from the tap

Slide 2

32.A surfer rides on the front side of a wave at a point where a tangent to the wave has a slope of Θ= 30 degree. The combined mass of surfer and surf board is m = 83 kg. The combined mass of surfer and surf board is m= 83 kg. The board has a submerged volume of v = 2.5 x 10^{-2} m^3. The surfer maintains his position on the wave as the wave moves at constant speed toward shore. What are the magnitude and direction of the drag force on the surf board from the water?



Slide 3 to 8

33. On a hot day in Las Vegas, an oil tanker loaded 37000 L of diesel fuel. It encounters cold weather on Utah where temperature was 23 Degree K lower than in Las Vegas. How many litres did it deliver?

Volume expansion for diesel fuel is 9.5 x 10^{-4} / Deg C coefficient of linear expansion is 11 x 10^{-6} /deg c

34. How much heat must be absorbed by ice of mass m = 720 g at – 10 deg c to take the liquid state at 15 deg c.

35. A copper slug whose mass m_c is 75 g is heated in a laboratory oven to a temperature T of 312 deg C . The slug is then dropped into a glass beaker containing mass m_w = 220 g of water. The heat capacity C_b of the beaker is 45 cal / deg K . The initial temperature T_i of the water and the beaker is

12 deg c. Assuming that the slug and the water does not vaporize. Find the final temperature T_f of the system at thermal equilibrium.

26.A cylinder contains 12 L of oxygen at 20 deg C and 15 atm. The temperature is raised to 35 deg C and the volume is reduced to 8.5L . What is the final pressure of the gas in atmosphere.?

27. One mole of oxygen expands at a constant temperature T of 310 deg K from an initial volume V_i of 12L to a final volume V f of 19 L. How much work is done by the gas during expansion?

28. The molar mass M of oxygen is 0.032 Kg/ mol (a) What is the average speed V avg of oxygen gas molecules at T = 300 deg K (b) What is the root mean square speed of V rms at 300 deg K (c) What is the most probable Vp at 300 deg K.

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(10) Heat , Heat Transfer & Wave

Slide 1 to 3

29.Three Carnot engines operate between reservoir temperatures of (a) 400 deg K and 500 deg K (b) 600 and 800 deg K (c) 400 and 600 deg K. rank the engineers according to thermal efficiencies. Greatest first.

Slide 4 to 6

30. Imagine a Carnot engine that operates between the temperatures T_H = 850 deg K and T_L = 300 deg K . the engine performs 1200J of work at each cycle which takes 0.25 sec.

(a) What is the efficiency of this engine?

(b) What is the average power "P" of this engine?

(c) How much energy Q_H is expected as heat from the high temperature reservoir every cycle?

(d) How much energy Q_L is delivered as heat to the low temperature reservoir each cycle?

(e) By how much does the entropy of working substance change as a result of the energy transferred to it from the high temperature reservoir? From it to the low temperature reservoir?

31. An inventor claims to have constructed an engine that has an efficiency of 75% when operated between the boiling and freezing points of water . Is this possible?

Harmonic motion & waves

Slide 7 to 10.

32. The block whose mass "m" is 680 g is fastened to spring whose spring constant K is 65 N/m . the block is pulled a distance X= 11 cm from it's equilibrium position at X = 0 on a fractionless surface and released from rest at t= 0.

(a) What are angular frequency, the frequency and period of resulting motion?

(b) What is the amplitude of oscillation?

(c) What is the maximum speed Vm of the oscillating block and where is the block when it has this period?

(d) What is magnitude of oscillation?

(e) What is the phase constant ϕ for the motion?

(f) What is the displacement function?

33. At t= 0, the displacement X(0) of the block is – 8.5 cm. The block's velocity V(0) is -0.92 m/ s and it's acceleration a (0) is 47 $m/s^{2.}$

(a) What is the angular velocity w of this system?

(b) What are the phase constant ϕ and amplitude Xm ?

Slide 11 to 12

34. For the damped oscillator m = 250 g , K = 85 N/m b = 70 g/s

(a) What is the period of the motion?

(b) How long does it take for the amplitude of the damped oscillations to drop to half it's initial value?

(c) How long does it take for the mechanical energy to drop to one half it's initial value?

35. A wave travelling along a string is described by Y (x,t) = 0.00327 Sin (72.1X – 2.72 t)

(a) What is the amplitude of this wave?

(b) What are the wave length, period and frequency of this wave?

(c) What is the velocity of this wave?

(d) What is the displacement Y at X = 22.5 cm and t = 18.9 sec?

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(11) Travelling wave ,light, electric field, magnetic field

Slide 1 to 3

36. At 18.9 sec, the transverse displacement y of the element of the string at X = 0.255 m is 1.92 mm

(a) What is U , the transverse velocity of the same element of the string at that time?

(b) What is the transverse acceleration a_y of the same element at that time?

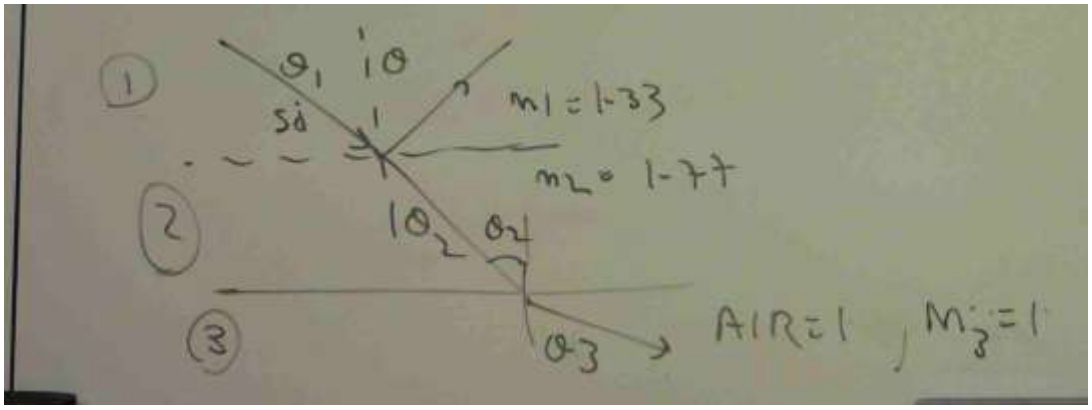
37.Write the equation for energy & power of the wave travelling along the string.

38.Define sound wave.

Light

Slide 4

37. The light that enters material " 2" at point A, then reached point "B" on the interface between material 2 and material 3. (a) what is the angle of reflection (b) What is the angle of reflection into the air?



Slide 5

38. a sodium vapour lamp is placed at the centre of a large sphere that absorbs all the lights reaching it. The rate at which the lamp emits the energy is 100W. Assume that the emission is entirely at a wave length of 590 nm . At what rate are photons absorbed by the sphere?

Slide 6 to 8

39.A potassium foil is a distance r = 8.5 m from an isotropic light source that emits the energy at the rate P = 1.5 w. the work function ϕ of potassium is 2.2 eV

(a) How long would it take for the foil to absorb enough energy to eject an electron? The circular path of foil radius is 5×10^{-11} m (b) Find the work function ϕ potassium.

40.Sketch the diagram & equation for momentum of photon.

Slide 9 to 10

41.An electron is confined to a one dimensional , infinitely deep potential energy well of L = 100 pm.

(a) What is the smallest amount of energy the electron can have?

(b) How much energy must be transmitted to electron if it is to make a quantum to electron if it is to make a quantum jump from ground state to second excited state?

(c)If the electron gains the energy for the jump from energy level E1 to energy level E3 by absorbing light, what light wave length is required?

Electric Field

Slide 11 to 19

42.Sketch the electric field between two plates carrying electric charges.

43. Explain the followings with sketches

(a) Flux of an electric field (b)Equipotential surface (c) Calculating the potential from the field (d) Spherical capacitor(e) Capacitors in parallel (f) Capacitors in series.

Magnetic Field

Slide 20 to 21

44. A uniform magnetic field $\vec{B}$ with magnitude 1.2 mT is directed vertically upward throughout the volume of a laboratory chamber. A proton with kinetic energy 5.3MeV enters the chamber, moving horizontally from South to North . What magnetic deflecting force acts on the proton as it enters the chamber? The proton's mass is 1.67×10^{-27} kg

Slide 22

45.Write the following formulae

(a) Magnetic field due to current (b) Magnetic field around two parallel current carrying conductors. (c) Ampere's law (d) Magnetic field inside a long straight wire with current (e) Magnetic field outside a long straight wire with current.

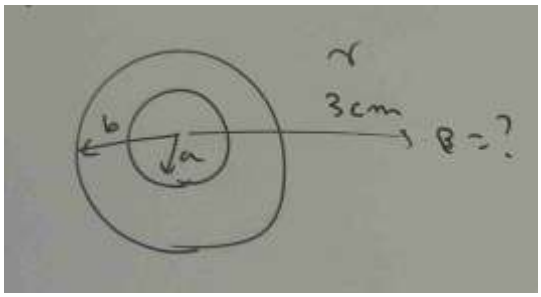
Slide 23 to 25

Q46.

The figure shows the cross section of a long conducting cylinder with inner radius a = 2 cm and outer radius b = 4 cm. The cylinder carries a current out of the page. The current density is $J = C r^2$

$C = 3 \times 10^6$ A/ m^4 , r in meter .

What is the magnetic field B at a point that is 3 cm from the central axis of the cylinder?



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(12) Faraday's law of induction

Slide 1+2

Q47. The long solenoid coil has 240 turns / cm and carries a current I = 1.7 amp. It's diameter is 3.28cm. At this centre , 180 turns are wound . The coil diameter is 2.1 cm. The current in the solenoid is reduced to zero at steady state in 30 ms , what is induced emf ?

Slide 3

Q48. A coil has an inductance of 63 mH and a resistance of 0.54 ohm.

(a) If a 12 V EMF is applied across the coil, how much energy is stored in the magnetic field after the current has built up to it's equilibrium value?

(b) After how many time constant will half this equilibrium energy be stored in the magnetic field?

Slide 4+5

Q48.Capacitance C is 15 µF and sinusoidal EMF device operates at amplitude Em = 36 V, frequency 60HZ (a) What are the potential difference Vc (t) across the capacitance and amplitude Vc of Vc (t).

(b) What are the current Ic (t) in the circuit as a function of time and the amplitude Ic of Ic(t)?

Slide 6+7

Q49.Explain (a) Di-magnetism (b) Para magnetism (c) Ferro magnetism

Q50.Sketch & write the equation for travelling electro-magnetic wave

Atom & Nuclear Physics

Slide 8

Q51.What are the properties of atom?

Slide 9

Q52.Describe insulator, metal and semi conductor in the aspect of atomic structure.

Slide 10

Q53.Write the equation to determine the Fermi energy level.

Slide 11+12

Q54. A 5.3 MeV Alpha particle happens by chance to be headed directly toward the nucleus of an atom of gold which contains 79 protons. How close does the alpha particle gets into the centre of nucleus before coming momentarily to the rest and reversing it's motion.

Slide 13 to 15

Q55.Describe the followings

(a) Nuclear radii (b) Atomic mass (c) Nuclear binding energy (d) Nuclear energy level

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(13) Nuclear Physics

Slide 1

Q56 Explain Nuclear spin

Q57 What is density of nuclear mass

Slide 2 , 3

Q58.What is the binding energy per nucleon for 120Sn?

Slide 4

Q59. Explain alpha decay

Q60.2.7L g sample of KCI from the chemistry stockroom isfound to be radioactive, and it is decaying at a constantrate of 4490 Bq. The decays are traced to the elementpotassium and in particular to the isotope ooK, whichconstitutes 1.I7''/'' of normal potassium. Calculate thehalf-life of this nuclide.

Slide 5

Q61 We are given the followitrg atomic masses:2389 23B.o5o 79 u aHe 4.ooz 6o u 234y6 234.043 63 u t11 1.007 83 u237pu z3i .o5r 2r uHere Pa is the symbol for the element protactinium (z :91).

Calculate the energy released during the alpha decay o12381;.

Slide 6

Q62. Explain (a) Beta decay (b) Radio active dating

Slide 7,8,9,10

Q63.A gamma ray dose of 3 GY is lethal to half people exposed to it. If the equivalent energy were absorbed as heat, what is temperature rise?

Q64. Explain Nuclear model

Q65.Explain nuclear fission

Slide 11

Q66.Explain the operation of nuclear reactor.

Slide 12 to 18

Q67.A large electric generating station is powered by apressurized-w ater nuclear reactor. The thermal powerproduced in the reactor core is 3400 MW and 1100 MWof electricity is generated by the station. The fuel chargeis 8.60 X I04 kg of uranium, in the form of uranium oxide,distributed among 5.70 x 104 fuel rods. The uraniumis enriched to 3 .0o/o23s11.
(a)What is the station's efflciency?

(b)At what rate R do flssion events occur in the reactor core?

(c) At what rate (in kilograms per duy) is the 23s11 fuel disappearing? Assume conditions at start-up.

(d) At this rate of fuel consumption, how long would the fuel supply o1 z3sg last?

(e) At what rate is mass being converted to other form of energy by the flssion o1 z3sg in the reactor core?

Q68.Explain nuclear fusion.

Q69.Sketch the diagram for nuclear fission

Q70.Explain atomic & nuclear burning.