# AR16

**CODE: 16ME1002** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**

**(AUTONOMOUS)**

**I B.Tech II Semester Regular & Supplementary Examinations, June-2018**

**ENGINEERING MECHANICS**

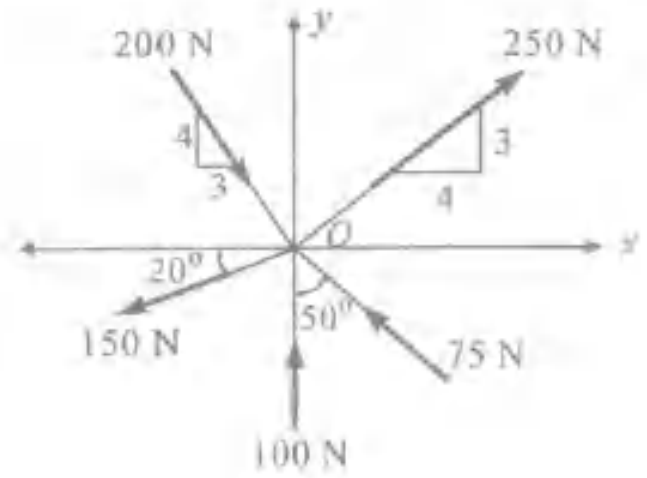
**(For CE, CSE & IT Branches)**

**Time: 3 Hours** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

## UNIT-I

1. a) State and prove the Lami's theorem. 4M
   b) Find the resultant of the forces shown in the figure, and the angle it makes with x-axis. 10M

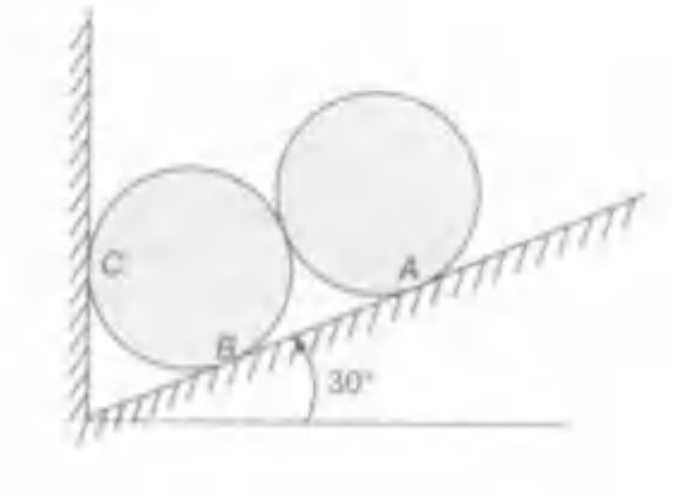



**(OR)**

2. a) State and derive parallelogram law of forces? 6M
   b) Two forces of magnitude 50 N and 30 N are acting at a point. If the angle between the two forces is $60^0$ , determine the magnitude and direction of the resultant force. 8M

## UNIT-II

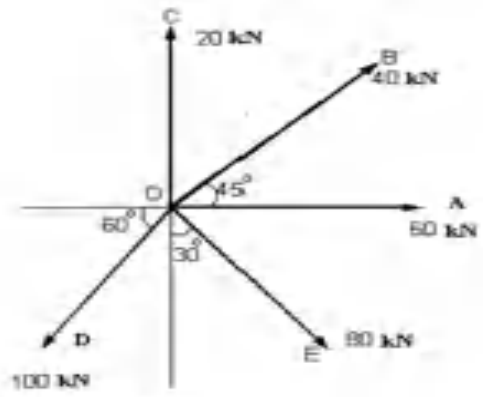
3. a) State the conditions for equilibrium of a rigid body in three dimensions. 4M
   b) Two identical rollers, each of weight 90 N are supported by an inclined plane and a vertical wall as shown in the figure. Determine the reactions at the points of supports A, B and C assuming all the surfaces to be smooth. Also, find the reaction forces between the spheres. 10M




**(OR)**

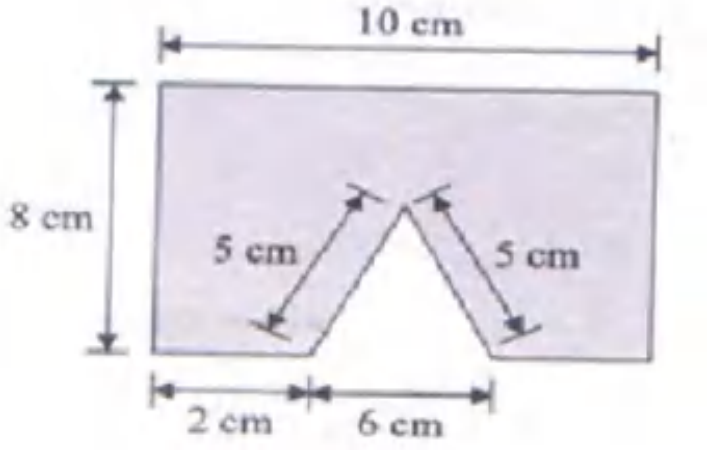
4. a) Explain and define the term Free Body Diagram. Draw the free body diagram of a ball of weight W, supported by a string AB and resting against a smooth vertical wall at C and also resting against a smooth horizontal floor at D. 5M

   b) Determine the resultant of the force system as shown in figure. 9M




## UNIT-III

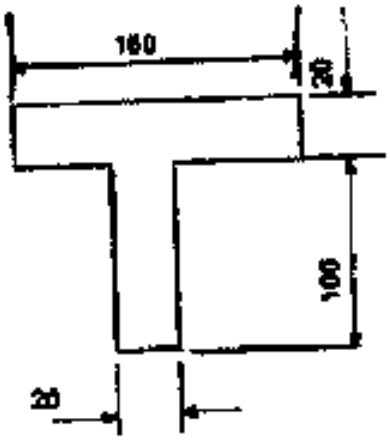
5. Determine the centroid of composite section shown in Figure. 14M



**(OR)**

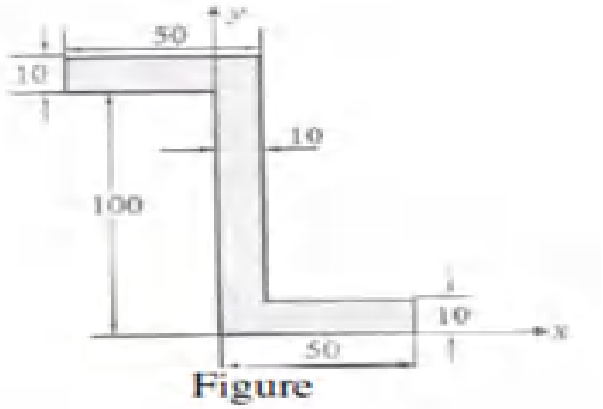
6. a) Why static coefficient of friction is always greater than kinetic coefficient of friction? 4M

   b) Find the centre of gravity of the lamina as shown in figure. All dimensions are in mm. 10M




## UNIT-IV

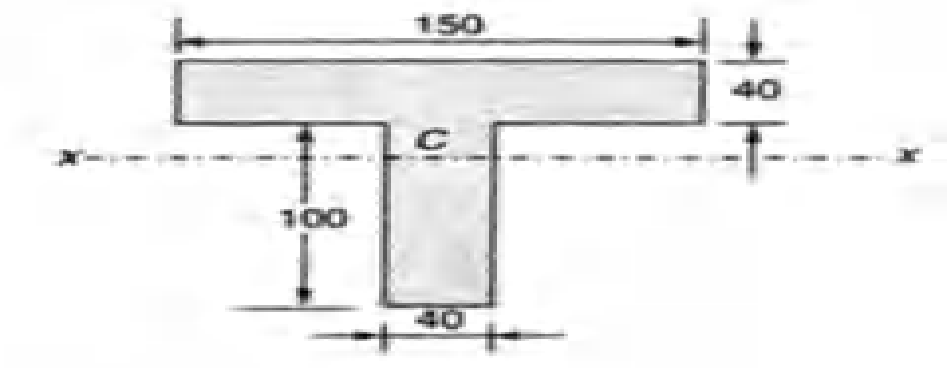
7. Find the Moment of Inertia about the centroidal axis in the given Figure. 14M




Figure

**(OR)**

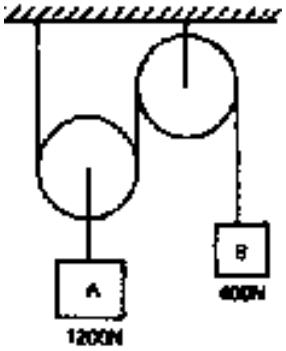
8. Calculate the product moment of inertia for an area shown in the figure. 14M



## UNIT-V

9. a) Write down the relationship between rectangular components and tangential and normal components of acceleration. 4M

   b) Determine the tension in the string and accelerations of blocks A and B weighing 1200 N and 400 N connected by an inextensible string as shown in figure. Assume pulley as frictionless and weightless. 10M




**(OR)**

10. a) Explain the difference between Rectilinear and Curvilinear motion. 4M

    b) A wheel accelerates uniformly from rest to a speed of 200 rpm in ½ sec. It then rotates at that speed for 2 sec before decelerating to rest in 1/3 sec. How many revolutions does it make during the entire time interval? 10M



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# AR16

**CODE: 16EC1002** **SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**

**(AUTONOMOUS)**

**I B.Tech II Semester Regular & Supplementary Examinations, June-2018**

**SWITCHING THEORY AND LOGIC DESIGN**

**(Electrical and Electronics Engineering)**

**Time: 3 Hours** **Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

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## UNIT-I

**1. a)** Perform the subtraction with the following binary numbers by taking the 2's complement. **8 M**

i) 11010 – 10000 ii) 11010 – 1101

**b)** Explain about parity checking and hamming code. **6 M**

**(OR)**

**2. a)** The state of a 12-bit register is 010110010111. What is its content if it represents: **6 M**

i) three decimal digits in BCD;

ii) three decimal digits in Excess-3 code;

iii) three decimal digits in the 2421 code?

**b)** Obtain the Hamming code for the 4 bit message 1011 using odd parity system. **8 M**

## UNIT-II

**3. a)** Given the following Boolean function: **6 M**

$$F = XY + XZ + \overline{Y}Z$$

i) Obtain the truth table of the function.

ii) Draw the logic diagram using the original Boolean expression.

iii) Simplify the function using principles of Boolean algebra.

**b)** Express the following functions in sum of minterms: **8 M**

i) $F = \overline{B}D + \overline{A}D + BD$

ii) $F = B\overline{C} + AB + ACD$

**(OR)**

**4. a)** Implement $F = A(B + CD) + B\overline{C}$ using NAND- NAND logic. **6 M**

**b)** Simplify the following expressions: **8 M**

i) $x\bar{y} + \bar{x}(y + z)$

ii) $(A\overline{B} + C)\overline{D} + E$

## UNIT-III

**5. a)** Simplify the Boolean expression using K-map and implement the simplified expression using NAND gates only. **7 M**

$$F(w, x, y, z) = \sum m(0,1,2,3,7,8,10) + \sum d(5,6,11,15)$$

**b)** Simplify the following Boolean functions using K-maps: **7 M**

$$F(v, w, x, y, z) = \prod M(0,2,3,4,5,6,7,11,15,16,18,19,23,27,31)$$

**(OR)**

**6. a)** Design 3 bit Gray to binary code converter. **7 M**

**b)** Simplify the following Boolean function using Tabulation method. **7 M**

$$F(A, B, C, D) = \sum m(1,3,4,5,10,11,12,13,14,15)$$

## UNIT-IV

**7. a)** Illustrate the operation of carry look ahead adder in detail **10M**

**b)** Implement a full subtractor using $3\times8$ decoder and OR gates. **4 M**

**(OR)**

**8. a)** Design a 4 bit parallel adder / subtractor. **8 M**

**b)** Implement the following Boolean function using $8\times1$ multiplexer **6 M**

$$f(A, B, C, D) = \sum m(2,4,5,7,10,14)$$

## UNIT-V

**9.** Explain about different flip-flops. **14M**

**(OR)**

**10. a)** Convert D flip-flop to JK flip-flop. **7M**

**b)** Describe bi-directional shift register. **7M**



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# AR16

**CODE: 16ME1004** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**

**(AUTONOMOUS)**

**I B.Tech II Semester Regular & Supplementary Examinations, June-2018**

**ENGINEERING MECHANICS (DYNAMICS)**

**(Mechanical Engineering)**

**Time: 3 Hours** **Max Marks: 70**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

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## UNIT-I

1. a Determine the centre of gravity of a solid right circular cone of height h and base circle radius R. 8M

   b A body consists of a solid hemisphere of radius 4 cm and a right circular solid cone of height 12 cm. The hemisphere and cone have a common base and are made of the same material. Locate the position of CG of the composite body. 6M

(OR)

2. a Derive the expression for the Mass moment of inertia of thin uniform rod about the centroidal axis. 6M

   b Derive the expression for the Mass moment of inertia of a Solid sphere. 8M

## UNIT-II

3. a A motorist is driving his car at 60 km/hr when he observes that a traffic light 250 m ahead turns red. The traffic light is timed to remain red for 20 seconds before it turns green. The motorist wishes to pass the traffic lights without stopping to wait for it to turn green. Calculate (i) the required uniform acceleration of the car and (ii) the speed of the car as it passes the traffic light. 5M

   b The motion of a particle is defined by the relations: $x = t^2+3t$ and $y = t^3- 8t^2+3$ where x and y are in meters and y is in seconds.(a) Write the equations defining the motion of the particle in vectorial form (b) Calculate the velocity and acceleration of the particle at time t = 2 seconds. 9M

**(OR)**

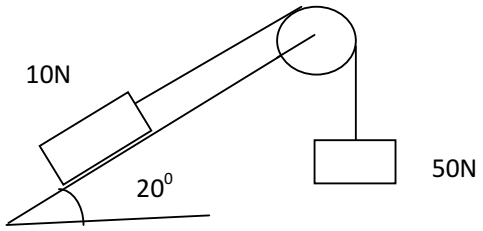
4. a An automobile enters a curved road at 30 km/hr and then leaves at 48 km/hr. The curved road is in the form of quarter of a circle and has a length of 400 m. If the car travels at constant acceleration along the curve, Calculate the resultant acceleration at both ends of the curve. 7M

b A projectile P is fired with a velocity of 200 m/s at an angle of $60^0$ with the horizontal. After sometime a missile M is shot from the same point to destroy the projectile. The angle of projection and the velocity for the missile are $45^0$ and 2000 m/s respectively. Calculate the height, horizontal distance and time with respect to firing of P at which the destruction takes place. 7M

## UNIT-III

5. a A bullet of mass 0.1 kg and travelling at a speed of 180 m/s penetrated 10 cm when fired into a wooden log. Determine the velocity with which this bullet would emerge when fired with the same velocity into a similar 5 cm thick wooden plank. Also determine the force of resistance assuming it to be uniform. 5M

b Two bodies of weights 50 N and 10 N are connected to the two ends of a light inextensible string which passes over a smooth pulley. The weight 10 N is placed on a rough inclined plane of angle of inclination $20^0$ while the weight of 50 N hangs vertically downward. If the coefficient of friction between the body and the plane is 0.2, Calculate the acceleration of the system and tension induced in the string **.** 9M




(OR)

6. a A flywheel of 1000 kg mass and 0.8 m radius of gyration is rotating at 180 rev/min. Determine its (a) kinetic energy, (b) torque and average power required to give the wheel at a speed of 180 rev/min in 75 revolutions. 5M

b A body of weight 8 N is suspended by a light rope wound round a pulley of weight 60 N and radius 30 cm. The other end of the rope is fixed to the periphery of the pulley. If the weight is moving downwards. Calculate for the acceleration of 8 N weight and tension in the string. 9M

## UNIT-IV

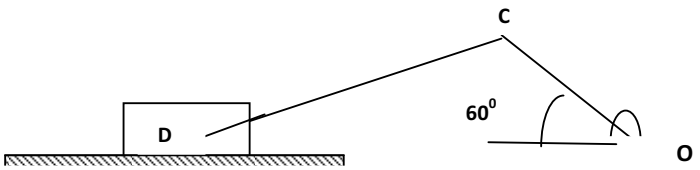
7. a Explain about the relative velocity and Instantaneous centre 5 M

   b A man running eastwards with a speed of 6 km/hr, feels the wind to be blowing directly from North. On doubling his speed, he feels the wind to blow from the North-East. Find the actual direction and velocity of the wind. 9M

(OR)

8. a Explain briefly about the kinetics of the rolling bodies. 4M

   b In a single slider crank mechanism Crank OC of 5 cm length and rotates at 300 rpm, attached to a connecting rod of length 30 cm. Determine (i) the angular velocity of connecting rod and (ii) velocity of piston 10M




## UNIT-V

9. a Explain the conservation of momentum with a neat sketch. 5M

   b A body of 10 kg mass moving towards right with a speed of 8 m/s strikes with another body of 20 kg mass moving towards left with 25 m/s. Determine: (i) final velocity of the two bodies (ii) loss in kinetic energy due to impact, and (iii) impulse acting on either body during impact. Take coefficient of restitution between the bodies as 0.65. 9M

(OR)

10. a A flywheel rotating at 300 rpm reduces its speed to 240 rpm while making 10 complete revolutions. Determine its angular retardation assuming it to be uniform. What is its speed after 3 seconds assuming the same retardation? Also, determine how much time is taken to come to a stop from a speed of 300 rpm. 8M

    b When a pelton wheel turbine is rotating at a constant angular speed of 1200 rpm, the water jet is shut off. If the frictional resistance in the bearings reduces the speed at a rate of $2\pi$ rad/s$^2$, determine the time taken to come to a stop and the number of revolutions made at that time. 6M



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# AR16

**CODE: 16EC1001** **SET-2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**

**(AUTONOMOUS)**

**I B.Tech II Semester Regular & Supplementary Examinations, June-2018**

## ELECTRONIC DEVICES

**(Electronics & Communication Engineering)**

**Time: 3 Hours** **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the Question must be answered at one place

### UNIT-I

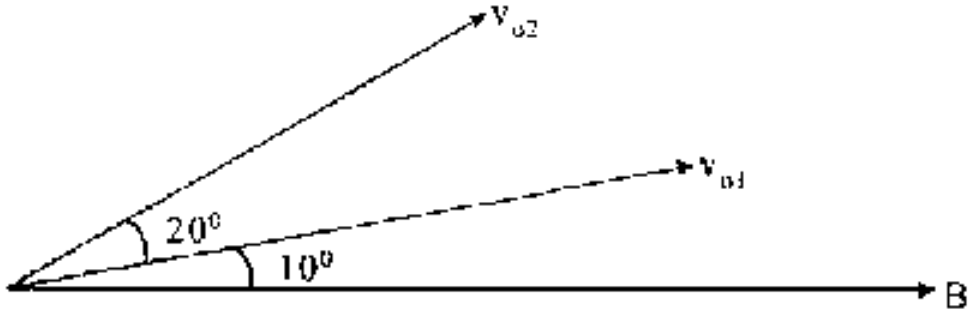
1. a) With the help of a neat sketch, describe principle and working of Cathode Ray Tube. 8M

   b) Explain CRO with neat black diagram 6M

**(OR)**

2. a) Derive the expression for radius R and time period T in the case of an electron placed in a magnetic field of intensity B tesla. 10M

   b) Two 50eV electrons enter a magnetic field of 2.0 m wb/$m^2$ as shown in Fig, one at 10° and the other at 20°. How far apart are these electrons when they have travelled one revolution in their helical paths? 4M




### UNIT-II

3. a) With the help of necessary equations, Explain the terms Drift Current and Diffusion Current. 8M

   b) A sample of Ge is doped to the extent of $10^{14}$ donor atoms/$cm^3$ and $7x10^{13}$acceptor atoms/$cm^3$. At room temperature, the resistivity of pure Ge is 60Ω-cm. If the applied electric field is 2V/cm, find total conduction current density.( $\mu_p$ for Ge is 1800$cm^2$/V-sec ; $\mu_n$ = 3800$cm^2$/V-sec) 6M

**(OR)**

4. a) Explain Mass Action Law and Law of Electrical Neutrality. 8M
   b) (i) Find the concentration of holes and electrons in p-type Germanium at $300^{o}$K, if $\sigma$= 100 □/cm. 6M
   ( ii) Repeat part (i) for n-type Si, if $\sigma$ = 0.1 □/cm. ($n_i = 2.5 \times 10^{13}/cm^3$)

## UNIT-III

5. a) Draw the forward and reverse characteristics of a Zener diode and explain them qualitatively. 8M
   b) Explain V-I characteristics of tunnel diode. 6M

**(OR)**

6. a) Explain the Space charge and Diffusion capacitance. 10M
   b) The transition capacitance of an abrupt junction diode is 20pF at 5V. Compute the value of decrease in capacitance for a 1.0 volt increase in the bias. 4M

## UNIT-IV

7. a) Describe the V-I characteristics of a BJT in Common Emitter Configuration and Explain. 8M
   b) Explain working of transistor with neat sketch. 6M

**(OR)**

8. a) Compare CB, CE and CC configurations 8M
   b) A Germanium transistor has $I_{CBO}$ =10μA at $27^{o}$C and β= 50. Find $I_C$ when $I_B$ =0.25mA and assuming β does not increase with temperature, find the value of new collector current, if the transistor's temperature rises to $50^{o}$C. 6M

## UNIT-V

9. a) Explain the Drain and Transfer characteristics of JFET 8M
   b) Show that for small values of $V_{GS}$ compared with $V_P$, the drain current is $I_D \approx I_{DSS} + g_{mo}V_{GS}$ 6M

**(OR)**

10. a) Compare BJT and JFET 7M
    b) Explain the V-I characteristics of SCR 7M



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# AR13

**Code: 13ME1003** **SET NO 2**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**I B.Tech II Semester Supplementary Examinations, June-2018**
**ENGINEERING MECHANICS**
**(Common to CE, CSE & IT)**

**Time: 3 hours** **Max Marks: 70**

**PART-A**

**Answer all questions** **[10X1=10M]**

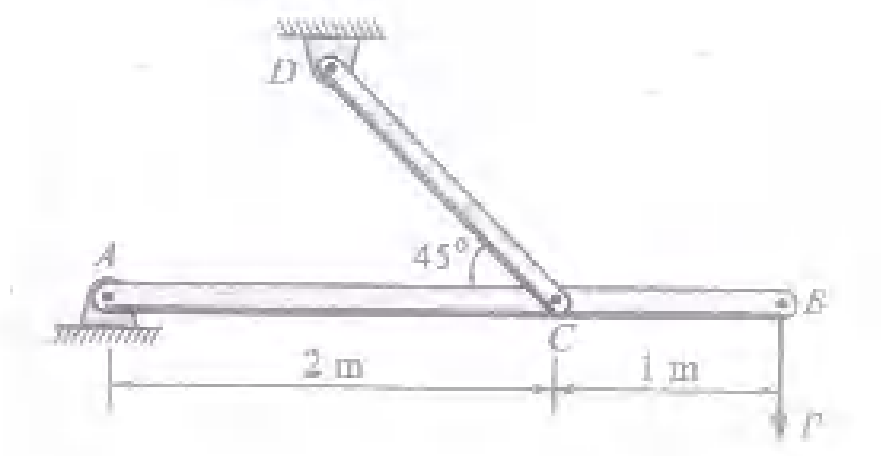
1. a) What is law of transmissibility?
   b) State parallelogram law of forces.
   c) Define the term free body diagram
   d) Define moment of a force.
   e) What is cone of friction?
   f) If an area has two axes of symmetry then where does the centroid lie?
   g) Define the term radius of gyration of a plane area.
   h) State the transfer formula for mass moment of inertia.
   i) Area under velocity and time diagram represents___.
   j) State D' Alembert's principle.

**PART – B**

**Answer one question from each unit** **[5X12=60M]**

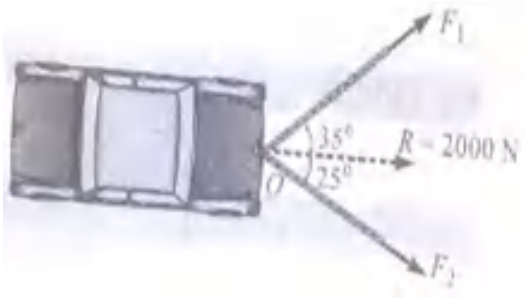
**Unit -1**

2. a) Discuss about different types of coplanar forces.
   b) A bar AB whose weight is negligible is hinged at C to another bar CD. Both A and D are hinged supports. A vertical load P is applied at B. Find the direction of reaction at A.



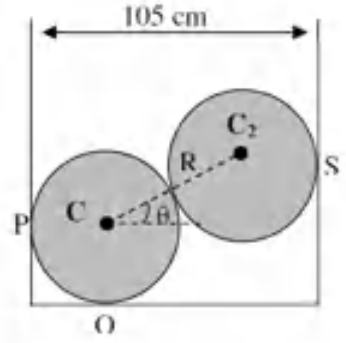

(OR)

3. a) Derive Varignon's theorem.
   b) A car is made to move by applying resultant force R= 2000 N along x-axis. This resultant is developed due to two pulling forces F1 and F2 on two ropes as shown in Figure. Determine the tension in individual ropes.



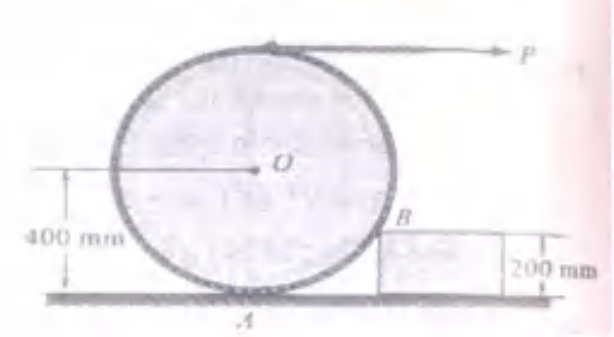

## Unit -2

4. Two identical spheres are kept in horizontal channel of width 105 cm as shown in Figure. Determine the reactions coming from all contact surfaces. Consider the radius of the spheres as 27 cm and weight 650 N



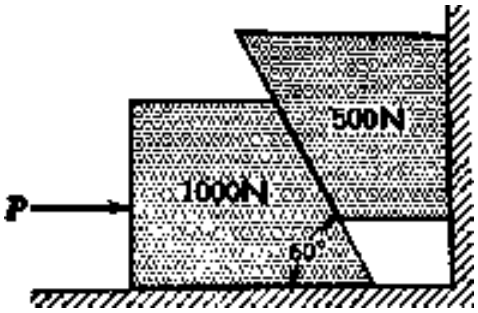

(OR)

5. A roller of radius 400 mm, weighing 4 kN is to be pulled over a rectangular block of height 200 mm as shown in Figure by a horizontal force applied at the end of a string wound round the circumference of the roller. Find the magnitude the horizontal force P and the reaction at B, which will just turn the roller over the corner of the rectangular block. Also determine the least force and its line of action at the roller centre, for turning the roller over the rectangular block.



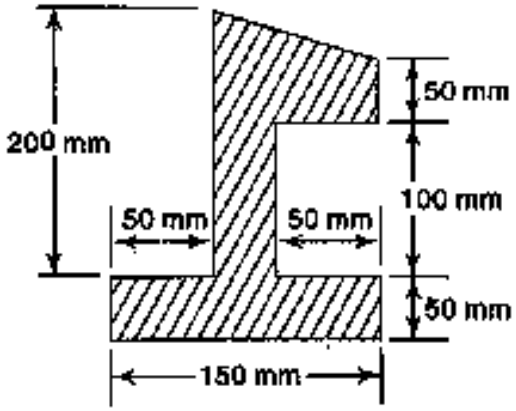
## Unit - 3

6. Referring to the Figure, the coefficients of friction are as follows 0.25 at the floor, 0.30 at the wall, 0.20 between the blocks. Find the minimum value of a horizontal force P applied to the lower block that will hold the system in equilibrium.



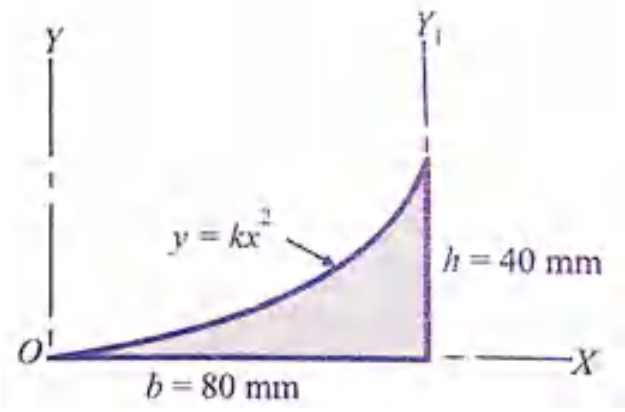

(OR)

7. Find the centroid of the composite area shown in Figure.




## Unit -4

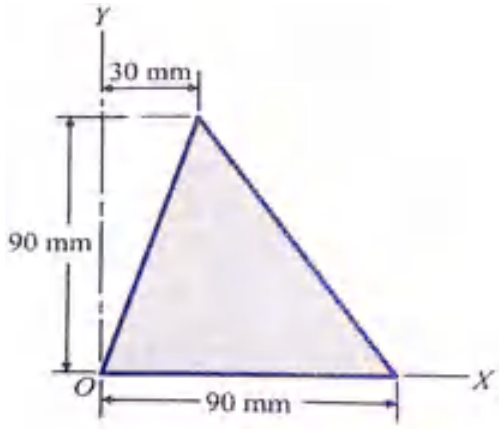
8. Find area moment of inertia of the shaded area shown in Figure about the axis $Y_1$.




(OR)

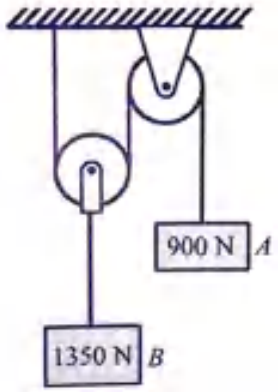
9. a) Define the following
   i. Area moment of inertia
   ii. Mass moment of inertia

b) Derive the formula for area moment of inertia of the triangle shown in Figure about X axis




## Unit - 5

10. a) Derive kinetic equation of motion in case of fixed axis rotation.
b) Through what distance will body A shown in Figure move in changing its velocity from 2 m/s to 4 m/s? Assume the pulleys to be friction less and of negligible weight.




(OR)

11. a) What are normal and tangential components of acceleration?
b) The motion of a particle is defined by the relations: $x = t^2+3t$ and $y = t^3- 8t^2+3$ where x and y are in meters and y is in seconds.(a) Write the equations defining the motion of the particle in vectorial form (b) Calculate the velocity and acceleration of the particle at time t = 2 seconds.



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AR13

CODE: 13BS1002 SET-2

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**

# I B.Tech II Semester Supplementary Examinations, June-2018

**ENGINEERING MATHEMATICS-II**

**(Common to EEE & ECE)**

**Time: 3 Hours** **Max Marks: 70**

## PART-A

**ANSWER ALL QUESTIONS** **[1 x 10 = 10 M]**

1. a) Write the approximation formula of Newton-Raphson Method 1M
   b) Write the Normal equations of Fitting of Second degree parabola 1M
   c) State Method of Principal of Least squares 1M
   d) Write Newton's interpolation formula 1M
   e) Write Lagrange's interpolation Formula 1M
   f) State Trapezoidal Rule 1M
   g) Write Milne's predictor formula 1M
   h) State Laplace transforms of derivative formula 1M
   i) State convolution theorem of Laplace transforms 1M
   j) Write the general one dimensional wave equation with boundary conditions 1M

## PART-B

**Answer one question from each unit** **[5x12=60M]**

### UNIT-I

2. a Using bisection method obtain a root of the equation $x^3 - x - 1 = 0$ 6M
   b The equation $x^3 - 3x + 4 = 0$ has one real root between -2 and -3. find the root to four places of decimals by false position method. 6M

**(OR)**

3. a Using Newton-Raphson method find the root of the equation $x + \log_{10} x = 3.375$ corrected to four significant figures. 6M

   b Fit a straight line to the following data by the method of least squares. 6M

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| y | 1 | 1.8 | 3.3 | 4.5 | 6.3 |

### UNIT-II

4. a Find the first and second derivatives of the function tabulated below at the point x = 0. 6M

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| y=f(x) | 4.21 | 5.11 | 6.20 | 12.80 | 23.70 | 36.80 |

   b Evaluate $\int_0^{1/2} \frac{x}{\sin x} dx$, taking the step size as 1/16 using Simpson's rule. 6M

**(OR)**

5. a The population of a certain town (as obtained from census data) is shown in the following table. Estimate the rate of growth of the population in the year 1981. 6M

| Year(x) | 1951 | 1961 | 1971 | 1981 | 1991 |
|---|---|---|---|---|---|
| Population in thousands(y) | 19.96 | 39.65 | 58.81 | 77.21 | 94.61 |

b Evaluate $\int_0^6 \frac{dx}{1+x}$ using Simpson's three-eight rule 6M

## UNIT-III

6. a find an approximate value of y for x = 0.1, x = 0.2, if $\frac{dy}{dx} = x + y$ and y = 1 at x = 0, using Picard's method. 6M

b Given $\frac{dy}{dx} = x^2 + y^2$ with y(0) = 0. Estimate y(0.4) using Runga-Kutta fourth order method. 6M

**(OR)**

**7.** a Estimate y(2) using Euler's method for h = 0.25, given that $\frac{dy}{dx} = 3x^2 + 1$ with y(1)=2 6M

b Solve $\frac{dy}{dx} = x + y,\ y(0) = 1$ for x = 2.0 using Milne's predictor-Corrector method. 6M

## UNIT-IV

8. a Find the Laplace transform of the following. 6M

i) $(t+3)^2 e^t$ ii) $e^{-t} Cos^2 t$

b Solve the Differential Equation $y^{11} - 3y^1 + 2y = 4t + e^{3t}$ using Laplace transform given that $y(0) = 1,\ y^1(0) = -1$ 6M

**(OR)**

9. a Find the Laplace Transform of i) $(t-2)^3 u(t-2)$, ii) $e^{-3t} u(t-2)$ using second shifting theorm. 6M

b Solve the following initial value problem by using Laplace transforms. 6M

$4y^{11} + \pi^2 y = 0 \qquad y(0) = 2,\ y^1(0) = 0$

## UNIT-V

10. a Form the partial differential equation by eliminating arbitrary constants 6M

$$z = xy + y\sqrt{x^2 - a^2 + b^2}$$

b Solve $y^3 \frac{\partial z}{\partial x} + x^2 \frac{\partial z}{\partial y} = 0$ by separation of variables. 6M

**(OR)**

11. a Solve $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)p = z(x - y)$ 6M

b Solve $(x - y)(px - qy) = (p - q)^2$ 6M



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# AR13

**CODE: 13ME1002** **SET-1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**

**I B.Tech II Semester Supplementary Examinations, June-2018**

**CLASSICAL MECHANICS**
**(Mechanical Engineering)**

**Time: 3 Hours** **Max Marks: 70**

## PART-A

**ANSWER ALL QUESTIONS** **[1 x 10 = 10 M]**

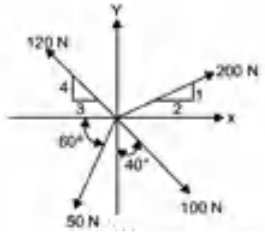
1. a) Define the terms resultant and equilibrant.
   b) State Lami's theorem.
   c) How do you check the perfectness of a truss?
   d) State principle of virtual work.
   e) Define the terms i) centroid and ii) centre of gravity.
   f) Define mass moment of inertia.
   g) Distinguish between kinematics and kinetics.
   h) What is dynamic equilibrium?
   i) Explain D -Alembert's principle in curvilinear motion.
   j) State impulse-momentum principle.

## PART-B

**Answer one question from each unit** **[5x12=60M]**

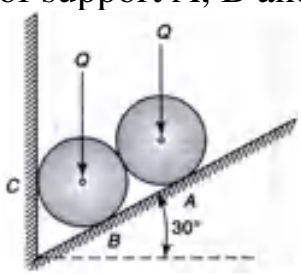
### UNIT-I

2. a) The resultant of two forces P and Q acting at a point is R. The resultant R gets doubled when Q is either doubled or its direction is reversed. Show that P, Q and R conform to the ratio P: Q: R = $\sqrt{2}$ :$\sqrt{3}$: $\sqrt{2}$. (6M)
   b) A system of four forces acting on a body is as shown in figure. Determine the magnitude and direction of resultant. (6M)



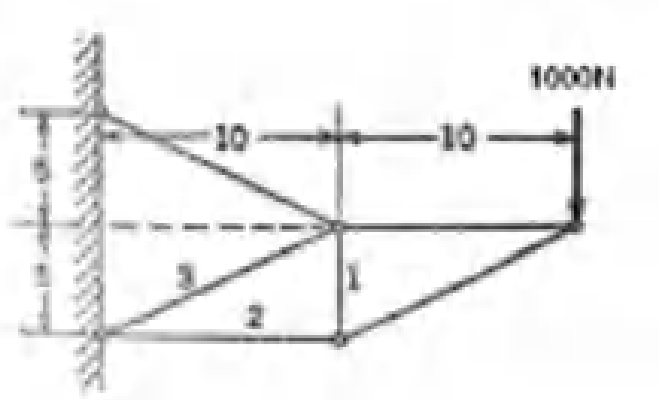

**(OR)**

3. a) State and prove Varignon's theorem. (6M)
   b) Two identical rollers, each of weight Q =1000 N are supported by an inclined plane and a vertical wall as shown in figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. (6M)



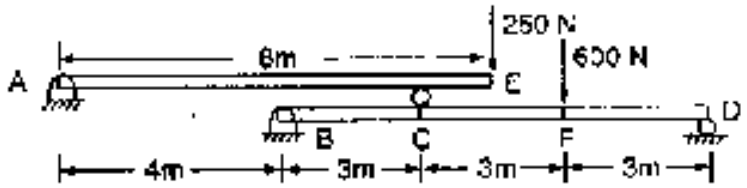
## UNIT-II

4. Find the forces in all the members of the truss shown in figure and indicate whether they are in tension or compression. (12M)



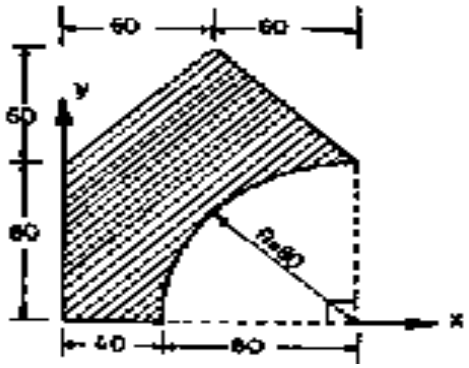

**(OR)**

**5.** Two beams AE and BD are supported and loaded as shown in figure. Determine the reactions at the points B and D using the method of virtual work. (12M)




## UNIT-III

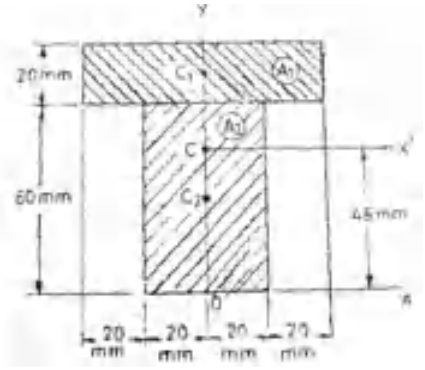
6. a) Find the coordinates of centroid of the shaded area shown in figure with respect to the x and y axes. All dimensions are in mm. (6M)




b) Determine the centre of gravity of a right circular cone of base radiurs R by integration method. (6M)

**(OR)**

**7.** Determine the moment of inertia of section shown in figure about its centroidal axes. (12M)




## UNIT-IV

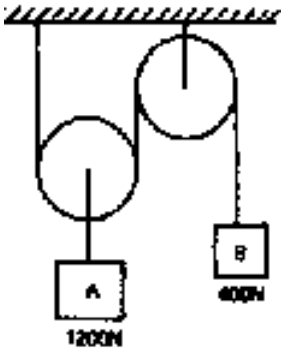
8. a) Three marks A, B, C spaced at a distance of 100 metres are made along a straight road. A car starting from rest and accelerating uniformly passes the mark A and takes 10 seconds to reach the mark B and further 8 seconds to reach the mark C. Calculate (i) the magnitude of acceleration of the car, (ii) the velocity of the car at A and (iii) the distance of the mark A from the starting point. (6M)

   b) An elevator cage of a mine shaft weighing 8 kN, when empty, is lifted or lowered by means of a wire rope. Once a man weighing 600 N, entered it and lowered with uniform acceleration such that when a distance of 187.5 m was covered, the velocity of the cage was 25 m/s. Determine the tension in the rope and force exerted by the man on the floor of the cage. (6M)

**(OR)**

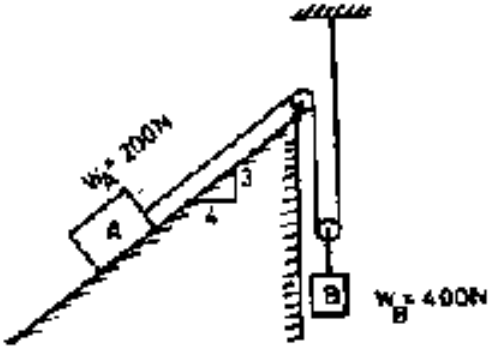
9. a) A particle moves along a straight line with an acceleration a = $6(S)^{1/3}$, when t = 3s, S = 64 m and its velocity is 48 m/s. Calculate velocity and acceleration when t = 2s. (6M)

   b) Determine the tension in the string and accelerations of blocks A and B weighing 1200 N and 400 N connected by an inextensible string as shown in figure. Assume pulley as frictionless and weightless. (6M)



## UNIT-V

10. By using work energy equation, calculate the velocity and acceleration of the block A shown in figure after it has moved 6 m from rest. The coefficient of kinetic friction is 0.3 and the pulleys are considered to be frictionless and weightless. Also calculate, the tension in the string attached to A.




(12M)

**(OR)**

11. a) A 20 kN automobile is moving at a speed of 70 kmph when the brakes are fully applied causing all four wheels to skid. Determine the time required to stop the automobile i) on concrete road for which $\mu = 0.75$, ii) on ice for which $\mu = 0.08$. (6M)

    b) A bullet is fired from the top of a mountain of height 300 m with a velocity of 200 m/s at an angle of elevation of $40^{o}$. Determine i) maximum elevation reached by the bullet above the ground ii) horizontal distance between the point of firing and the point where the bullet will strike the ground and iii) the velocity with which it hits the ground. (6M)



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