AR16

CODE: 16ME1002 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, August-2018

ENGINEERING MECHANICS

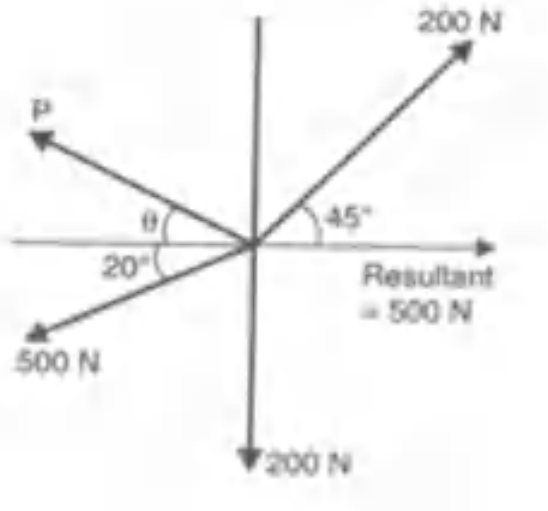
(Common to CE, CSE & IT Branches)

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 triangular law of forces and what is the use of this law? 4M
   b) The four coplanar forces are acting at a point as shown in the figure. One of the forces is unknown and its magnitude is shown by P. The resultant is having a magnitude of 500 N and acting along x-axis Determine the unknown force P and its inclination with x-axis. 10M

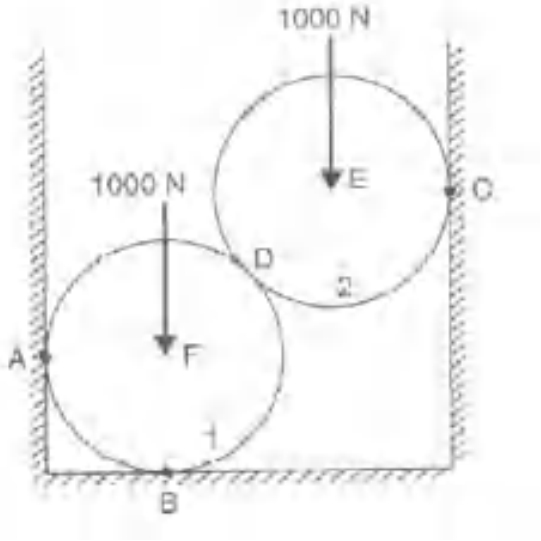


(OR)

2. a) Define coplanar, non-concurrent forces and coplanar concurrent forces. 4M
   b) Find the magnitude and direction of the resultant of the concurrent forces of 80 N, 120 N, 150 N and 200 N making angles of 30^0, 70^0, 120^0 and 155^0 respectively with the X – axis. 10M

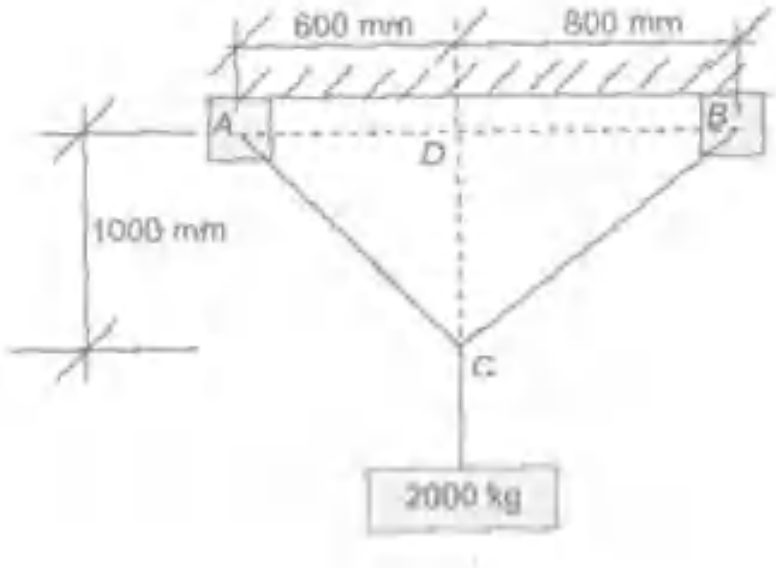
UNIT-II

3. a) State and prove Varignon's theorem. 5M
   b) Two spheres, each of weight 1000 N and radius 25 cm rest in a horizontal channel of width 90 cm as shown in the figure. Find the reactions on the points of contact A, B and C. 9M



(OR)

4. Draw the free body diagram and calculate the tensions in AC and BC shown in figure. 14M



UNIT-III

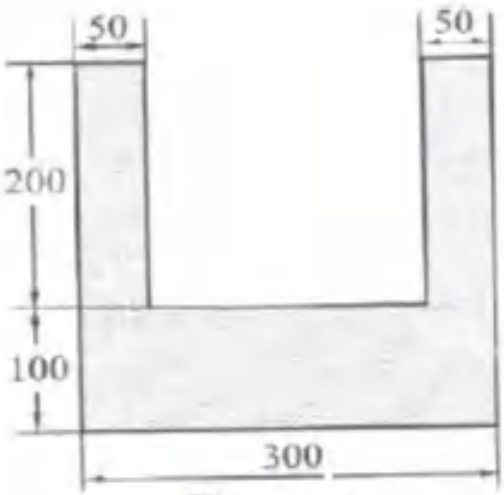
5. a) What is centroid and centre of gravity? State the differences clearly. 4M
   b) Determine the force required to move a load of 240 N up a rough plane. The force is applied parallel to the plane. The inclination of the plane is such that a force of 60 N inclined at 30^0 to a similar smooth plane would keep the same load in equilibrium. Coefficient of friction is 0.03. 10M

(OR)

6. a) State and prove theorems of Pappus. 5M
   b) Prove that the angle of friction is equal to the angle of the inclined plane, when a solid body of weight W placed on the inclined plane is about to slide down. 9M

UNIT-IV

7. Calculate the Moment of Inertia about the centroidal x and y for the section shown in the Figure. 14M



Figure

(OR)

8. a) State and Prove the parallel axis theorem, to determine the moment of inertia of areas with the help of a neat sketch. 7M
   b) Describe the method of finding Moment of Inertia of composite areas. 7M

UNIT-V

9. a) Define (i) Angular displacement (ii) Angular velocity (iii) Angular acceleration. 6M
   b) A stone is dropped from a tall tower of height 180 m at the same another one is projected from the foot of the tower with a velocity of 44 m/sec. Determine when and where the two meet? 8M

(OR)

10. a) Define the motion of fixed axis rotation and give an example. 4M
    b) A wheel, rotating about a fixed axis at 30 r.p.m is uniformly accelerated for 50 seconds, during which time it makes 40 revolution. Find: (i) angular velocity at the end of this interval, and (ii) time required for the speed to reach 80 revolution per minute. 10M

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AR16

CODE: 16EC1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, August-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

UNIT-I

1. a) Represent decimal number 8620 in **8 M**

i) BCD code ii) Excess-3 code iii) 2421 code iv) as a binary number.

b) Determine the value of b for following. **6 M**

i) $(16)_{10} = (100)_b$ ii) $(292)_{10} = (1204)_b$

(OR)

2. a) Perform the subtraction with the following decimal numbers using 10's complement of the subtrahend. **6 M**

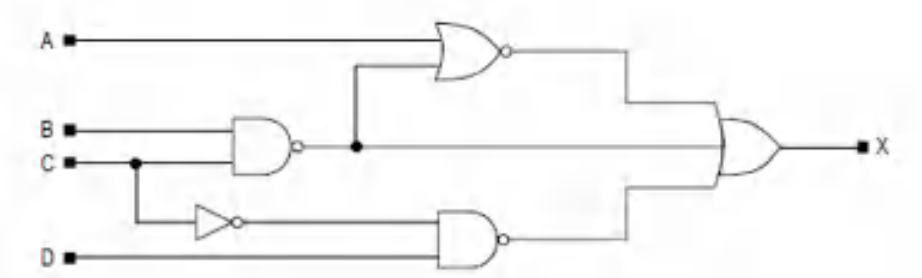
i) 5250 - 321

ii) 20 - 1000

b) Explain about Parity checking and Hamming Code **8 M**

UNIT-II

3. a) Write the logic expression and simplify it as much as possible and draw a logic diagram that implements the simplified expression. **10 M**



b) Realize EX-NOR using minimum number of NAND gates. **4 M**

(OR)

4. a) Express the following functions in product of maxterms:

i) $(xy+z)(y+xz)$ **8 M**

ii) $(AB+A'B')(CD'+C'D)$

b) Implement $F = x'y + xy' + z$ using NOR gates only. **6 M**

UNIT-III

5. a) Simplify and implement the simplified expression using NOR gates only. **7 M**

$$F(w,x,y,z) = \sum m(3,4,13,15) + \sum d(1,2,5,6,8,10,12,14)$$

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

$$F(A,B,C,D,E) = \sum m(0,2,3,4,5,6,7,11,15,16,18,19,23,27,31)$$

(OR)

6. a) Design a digital circuit that converts a BCD code to Excess-3 code. **8 M**

b) Simplify and implement with NAND gates only. **6 M**

$$F(A,B,C,D) = \sum m(2,5,6,9,11,15)$$

UNIT-IV

7. a) Illustrate the operation of BCD adder in detail. **7 M**

b) Implement a full adder function using 4×1 multiplexers. **7 M**

(OR)

8. a) A combinational circuit is defined by the following three Boolean functions. Design the circuit with a decoder and external gates. **8 M**

$$F_1 = X'Y'Z' + XZ;\ F_2 = XY'Z' + X'Y;\ F_3 = X'Y'Z + XY$$

b) Design a combinational circuit that compares the magnitude of two numbers with one bit each. **6 M**

UNIT-V

9. a) Illustrate the difference between asynchronous and synchronous sequential circuits. **6 M**

b) Draw the logic diagram of mod 6 ripple counter using T flip-flops and explain its operation. **8 M**

(OR)

10. a) Convert a T flip-flop to SR flip-flop. **6 M**

b) Design a bi-directional shift register. **8 M**

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AR16

CODE: 16ME1004 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, August-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 at one place

UNIT-I

1. (a) Derive an expression that determines the centre of gravity of a solid hemisphere of radius R. 7 M
   (b) Derive an expression that determines the centre of gravity of a cone. 7 M

(OR)

2. (a) Determine the mass moment of inertia about a diameter of a sphere of mass *m* and radius R. What is the radius of gyration? 8 M
   (b) Derive an expression to determine the mass moment of inertia of a thin circular ring of radius *'r'* 6 M

UNIT-II

3. (a) A particle moves along a straight line with an acceleration described by the function $a=4t^2-2$, where *'a'* is the acceleration in m/s^2 and t is the time in sec. when t=0, the particle is located 2 m to the left of the origin and when t=2 sec, it is 20 m left of the origin. Determine the position of the particle when t=4 sec 12M

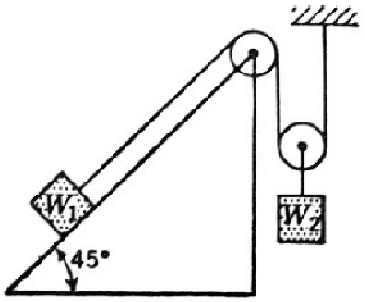
(OR)

4. (a) Two trains *A* and *B* leave the same station o parallel lines. A starts with uniform acceleration of 1/6 m/s^2 to and attain a speed of 24 km/hr, when the steam is reduced to keep the speed constant. *B* leaves 40 sec after with uniform acceleration of 1/3 m/s^2 to attain a maximum speed of 48 km/hr. When will *B* over take *A*. 8 M

(b) A body moves along a curve defined by the relation $r=5\theta$. If the angle $2\theta=t^2$ radians, find the velocity and acceleration of the body when $\theta=\pi/2$. 6 M

UNIT-III

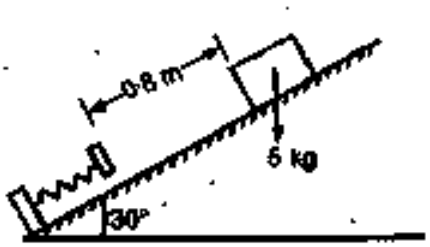
5. (a) A block of weight W_1 resting on an inclined plane is connected by a string and pulleys to another block of weight W_2 as shown in the figure below. If the coefficient of friction is 0.25 between the weight and surface, determine the tension in the string during the motion of the system. 12M



(OR)

6. (a) A body of weight 20 N falls freely from rest, from a height of 10 m above ground. Find the potential energy, kinetic energy and their sum (i) just before the body is released (ii) when it has fallen 2 m, (iii) just as it hits the ground. 7 M

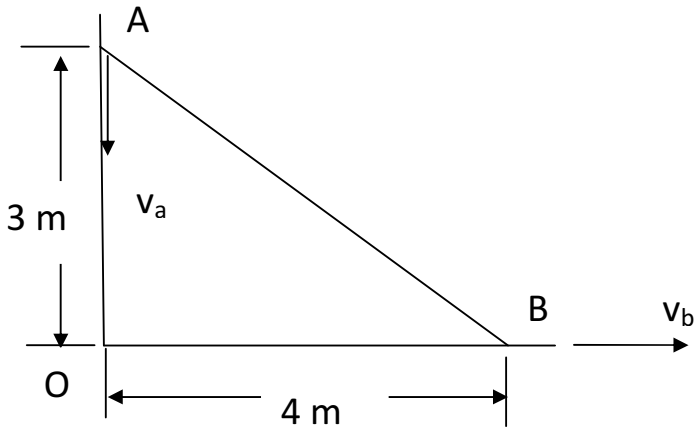
(b) A block of mass 5 kg is released from rest on an inclined plane as shown in the figure below. If the spring constant is 1 N/mm and the coefficient of friction between the block and the inclined plane is 0.2, find the maximum compression of the spring. 7 M



UNIT-IV

7. (a) Describe the work energy principle. 6 M

   (b) A ladder with two ends *A* and *B* is shown in the figure. The end *A* moves with a velocity V_A downwards along the wall. Find the velocity of end B in terms of V_A 8 M



(OR)

8. (a) Differentiate between Relative velocity method and Instantaneous centre method in connection to kinematics of plane motion. 7 M

   (b) A wheel of radius 1 m rolls freely with an angular velocity of 5 rad / sec. and with an angular acceleration of 4 rad / sec^2 both clockwise as shown in Fig. Determine the velocity and acceleration of points B and D in the figure. 7 M

UNIT-V

9. (a) A ball '*A*' of mass 3kg moving with a velocity of 2 m/s strikes directly a ball '*B*' of mass 6 kg at rest. The ball *A* after striking, comes to rest. Find the (i) velocity of ball B after striking and (ii) coefficient of restitution. 7 M

   (b) Three perfectly elastic balls *A, B, C* of masses 2 kg, 4 kg and 8 kg move along a line with velocities 4 m/s, 1 m/s and 0.75 m/s, respectively. If ball *A* strikes ball *B* which in turns strike ball *C*, determine the velocities of the three balls after impact. 7 M

(OR)

10. In a coal mine a lifting cage weighing 5 kN raised by winding a rope round a drum of 1.5 k N weight. The diameter of the drum is 1.5 m and the radius of gyration is 80 cm. The drum is rotated at a constant speed of 20 rpm by a 40 hp electrical motor. Calculate (i)Linear acceleration or retardation of the cage (ii) tension in the rope. 14 M

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AR16

CODE: 16EC1001 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, August-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 in one place only

UNIT-I

1.	a	Discuss the motion of an electron between two parallel plates under the influence of applied potential?	6M
	b	An electron is accelerated through a potential of 40v before it enters a magnetic field density of 0.91Wb/ m^2 at an angle of 30 degrees with the field. Find the position of the electron after which it has completed one revolution in the field?	8M
		(OR)	
2.	a	Explain the following : a)Electrostatic Deflection Sensitivity b) Magnetic Deflection Sensitivity	6M
	b	Explain the block diagram of CRT?	8M

UNIT-II

3.	a	Explain Semiconductors, Insulators and Metals classification using energy band diagrams?	10M
	b	Explain diffusion and Drift currents.	4M
		(OR)	
4.	a	Prove that the position of fermilevel lies exactly at the center in an intrinsic semiconductors?	4M
	b	Derive continuity equation for electrons?	10M

UNIT-III

5.	a	Derive an expression for Ideal diode equation?	10M
	b	Draw Energy band diagram for PN Junction diode in open-circuit condition?	4M
		(OR)	
6.	a	With the help of Energy band diagrams explain V-I Characteristics of Tunnel Diode?	12M
	b	What is Avalanche Breakdown?	2M

UNIT-IV

7.	a	Explain the input and output characteristics of NPN Transistor in Common Emitter Configuration?	12M
	b	What is Early effect?	2M
		(OR)	
8.	a	Explain how Transistor will work as an amplifier?	6M
	b	Explain the V-I Characteristics of Photo Transistor?	8M

UNIT-V

9.	a	Explain the Drain and Transfer Characteristics of N-Channel JFET?	12M
	b	Write the relation between μ,rd and gm ?	2M
		(OR)	
10.	a	Explain the operation of Depletion mode MOSFET?	7M
	b	Explain the V-I characteristics of UJT ?	7M

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AR13

CODE: 13ME1003 **SET-1**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, August-2018

ENGINEERING MECHANICS
(Common to CE, CSE & IT Branches)

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

PART-A

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

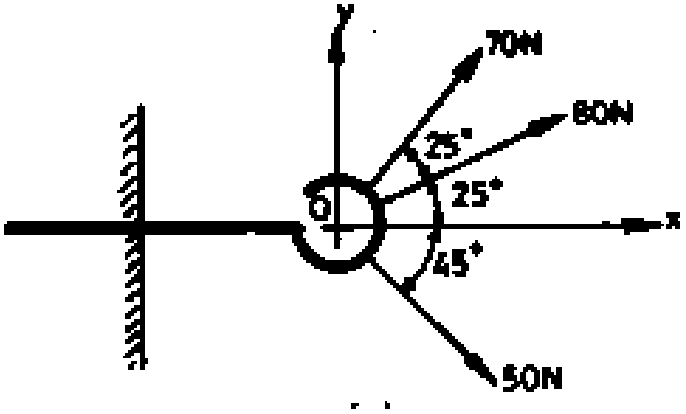
1. a) Define non-coplanar concurrent force system
   b) What is the statement of Lami's theorem
   c) What is the statement of varignon's theorem
   d) Define centre of gravity
   e) What is the use of axis of symmetry for finding centroid
   f) Define polar moment of inertia
   g) Define coefficient of friction
   h) Differentiate static friction and dynamic friction
   i) Define rectilinear motion
   j) What is the statement of D-Alembert's principle

PART-B

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

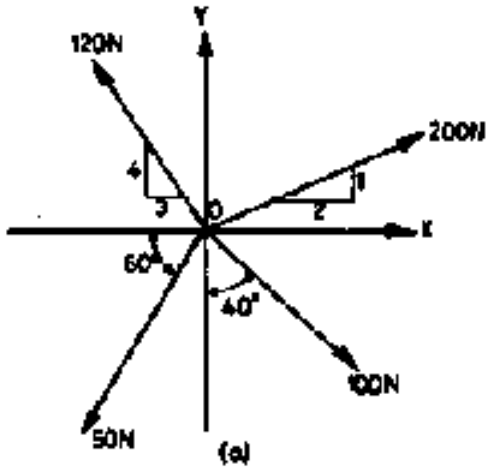
UNIT-I

2. Determine the resultant of the three forces acting on a hook as shown in below figure **12M**



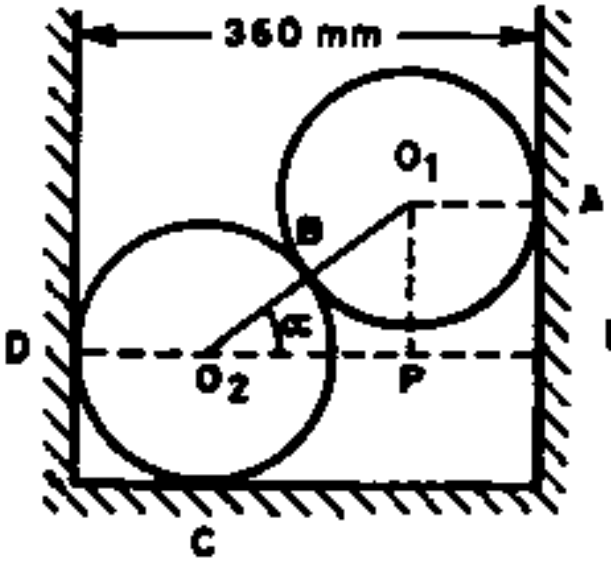
(OR)

3. Determine the magnitude and direction of resultant of the following force system. **12M**



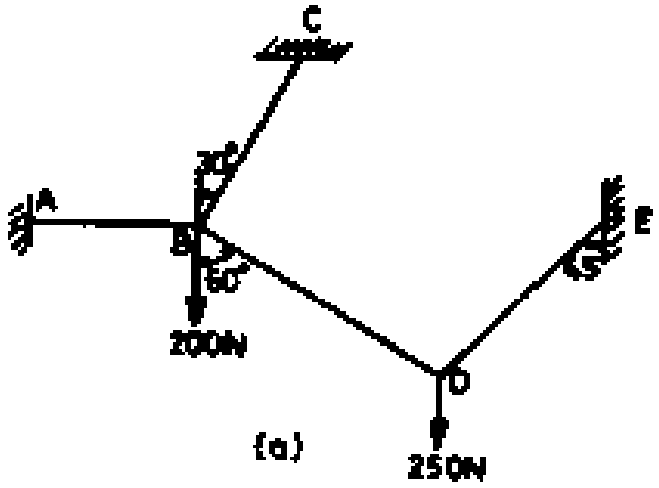
UNIT-II

4. Two smooth spheres each of radius 100 mm and weight 100 N, rest in a horizontal channel having vertical walls, the distance between which is 360 mm. Find the reactions at the points of contacts A, B, C and D as shown in below figure. **12M**



(OR)

5. A system of connected flexible cables shown in below figure is vertical forces 200 N and 250 N at points B and D. Determine the forces in various segments of the table. **12M**



(a)

UNIT-III

6. A pull of 90 N applied upwards at 30^0 a rough horizontal plane was required to just move a body resting on the plane while a push of 110 N applied along the same line of action was required to just move the same body downwards. Determine the weight of the body and the coefficient of friction. **12M**

(OR)

7. Determine the centroid for quadrant of a circle by using integration method **12M**

UNIT-IV

8. State and prove parallel axis theorem and perpendicular axis theorem **12M**

(OR)

9. Determine the mass moment of inertia of a rectangular plate of size axb and thickness t about its centroidal axes. **12M**

UNIT-V

10. A burglar's car had a start with an acceleration of 2 m/s^2. A police vigilant party came after 5 seconds and continued to chase the burglar's car with a uniform velocity of 20 m/s. Find the time taken, in which the police van will overtake the burglar's car. **12M**

(OR)

11. At a certain instant, a body of mass 10 kg, falling freely under the force of gravity, was found to be falling at the rate of 20 m/s. What force will stop the body in (i) 2 seconds and (ii) 2 metres? **12M**

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AR13

CODE: 13BS1002 SET-1

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(AUTONOMOUS)

I B.Tech II Semester Supplementary Examinations, August-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) Briefly write the principle of iteration procedure.
   b) Write the normal equations of the curve $y = ax^b$ by least squares method.
   c) Prove that $\nabla E = \Delta$.
   d) What is the rule required for Simpson's 3/8 rule for number of divisions of the interval?
   e) Write the formula used in Euler's method.
   f) What are single step methods?
   g) What is the formula for LT of second derivative of a function?
   h) Find the inverse LT of $\frac{3\left(s^2-2\right)}{2s^3}$
   i) Form the PDE of z=xy.
   j) Write any two types of standard nonlinear PDEs of 1st order.

PART-B

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

UNIT-I

2. **a** Find a real root of the equation $x e^x - Cos\, x = 0$ using Newton Raphson method correct upto 2 decimal places in the interval (0,1). **5M**

   b Fit a Parabola to the following data by the method of least squares. **7M**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

(OR)

3. **a** Using Newton-Raphson method find Square root of a number. Apply the method to N = 24 to obtain the result correct to 3 places after decimal by taking initial approximation as $x_0 = 4.8$. **6M**

b Fit an exponential curve $y = ae^{bx}$ to the following data by the method of least squares. **6M**

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.6

UNIT-II

4 a A function f(x) is given by the following table **7M**

x	0	1	2	3	4	5	6
f(x)	176	185	194	203	212	220	229

Obtain the value of f(x) at x = 0.6 by interpolation.

b The following table gives the values of $\log_{10}^{x}$. Obtain the value of $\log_{10}^{301}$ by Lagrange interpolation. **5M**

x	300	304	305	307
$\log_{10}^{x}$	2.4771	2.4829	2.4843	2.4871

(OR)

5 a Find the unique polynomial f(x) of degree 2 or less such that f(1) = 1 , f(3) = 27 , f(4) = 64, using Lagrange's interpolation formula. **7M**

b A curve is drawn to pass through the points given by the following table **5M**

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Estimate the area bounded by the curve. X-axis and the lines x = 1, x =4 by using Simpson's 1/3 rule.

UNIT-III

6 Solve the ODE $\frac{dy}{dx} + 3y = 2e^x$, y(0) = 0 using Taylor's series method and compute y(0.1) and y(0.2) upto 4th order derivative. Also compare the results with the exact solutions. **12M**

(OR)

7 Obtain the values of y at x = 0.1, 0.2 using Runga-Kutta method of (i) third order (ii) Fourth order for the differential equation $y^1 + y = 0,\ y(0) = 1$. **12M**

UNIT-IV

8. a Evaluate $L\left[\frac{(1-\cos t)}{t^2}\right]$ **6M**

b Find the inverse LT of $\frac{S e^{\frac{-S}{2}} + \pi e^{-S}}{S^2+\pi^2}$ **6M**

(OR)

9. a Evaluate $L\left[\frac{Cos\,2t - Cos\,3t}{t}\right]$. **5M**

b Solve by LT method : $\frac{d^3y}{dt^3} + 2\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0$, **7M**

given $y = 1, \frac{dy}{dt} = 2, \frac{d^2y}{dt^2} = 2\ at\ t = 0$

UNIT-V

10 a Form the PDE from F (x + y + z, $x^2 + y^2 + z^2$) = 0 **6M**

b Solve the non linear PDE $x^2p^2 + y^2q^2 = z^2$ **6M**

(OR)

11 A tightly stretched string with fixed end points x=0 and x=1 is initially in a position given by $y = y_c \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position, find the displacement y(x,t). **12M**

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AR13

CODE: 13ME1002 **SET-2**

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)
I B.Tech II Semester Supplementary Examinations, August-2018

CLASSICAL MECHANICS
(Mechanical Engineering)

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

PART-A

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

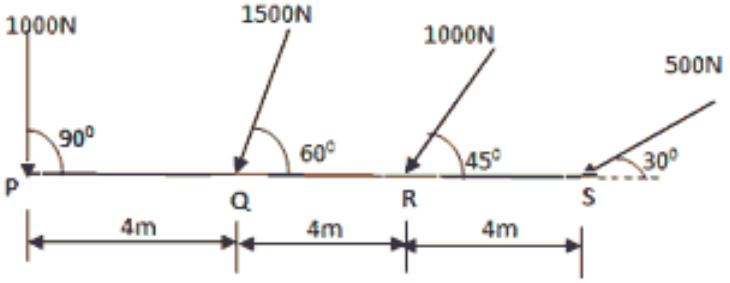
1. a) Define coplanar and concurrent forces with examples??
   b) Two forces P and Q are acting along the same line then resultant is?
   c) Which type of forces are acting in pin jointed truss and differentiate truss with frame?
   d) What is principle of virtual work?
   e) Define centroid?
   f) The moment of inertia of a triangle of base b and height h about an axis passing through apex is (axis is parallel to base)?
   g) Define linear velocity and angular velocity of a particle?
   h) Define angular momentum and write mathematical equation?
   i) Equations of linear kinetic energy and rotational kinetic energy?
   j) Define D'alemberts principle?

PART-B

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

UNIT-I

2. a A horizontal line PQRS is 12 m long, where PQ = QR = RS = 4 m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R and S respectively with downward direction. The lines of action of these forces make angles of 90°, 60°, 45° and 30° respectively with PS. 8M

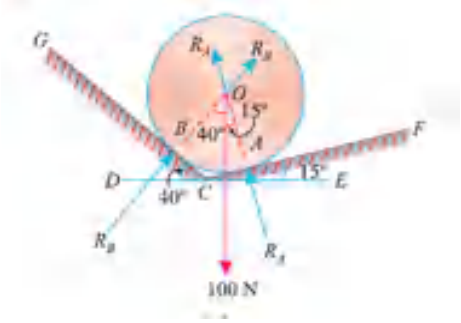


Find (i) Magnitude of the resultant force (ii) Direction of the resultant force (iii)Position of the resultant force.

b State and prove the parallelogram law of system of forces? 4M

(OR)

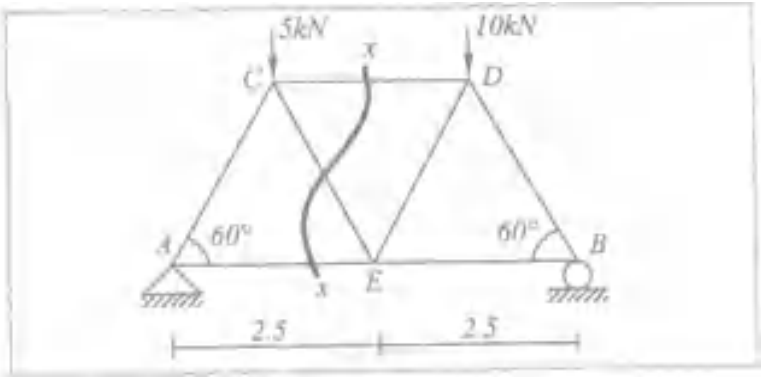
3. a A smooth circular cylinder of radius 1.5 meter is lying in a triangular groove, One side of which makes 15° angle and the other 40° angle with the horizontal. Find the reactions at the surfaces of contact, if there is no friction and the cylinder weights 100N. 8M



b Briefly explain principle moment of force? 4M

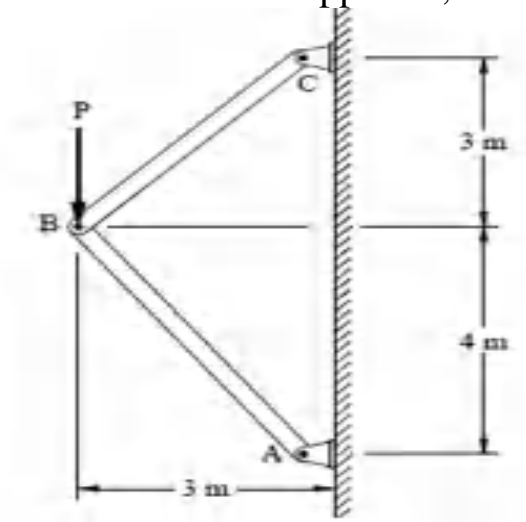
UNIT-II

4. Determine forces in member CD, CE and AE of truss shown in figure 12M



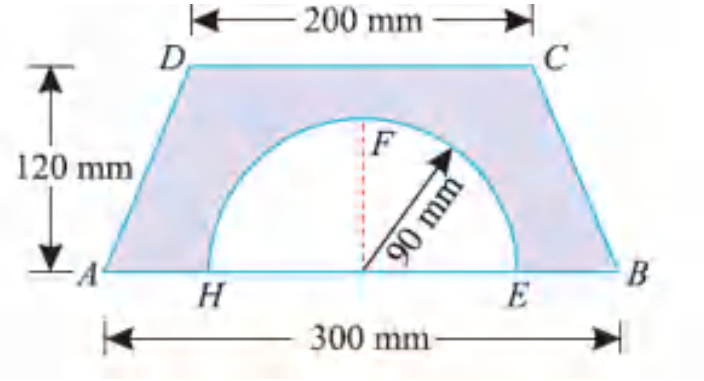
(OR)

5. Determine the vertical reaction at support C, if P = 2 kN. 12M



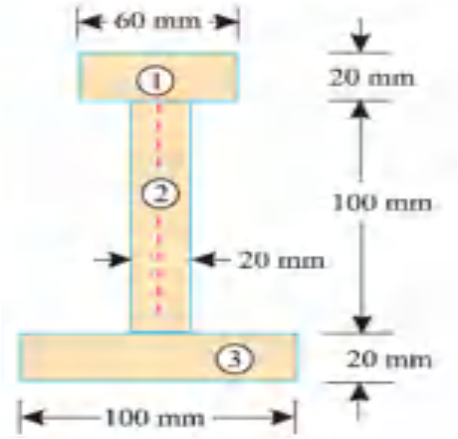
UNIT-III

6. A semicircle of 90 mm radius is cut out from a trapezium Find the position of the centre of gravity of the figure. 12M



(OR)

7. An I-section is made up of three rectangles as shown in Fig. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section. 12M



UNIT-IV

8. a A stone is dropped from the top of a tower 50 m high. At the same time, another stone is thrown upwards from the foot of the tower with a velocity of 25 m/s. When and where the two stones cross each other? 8M

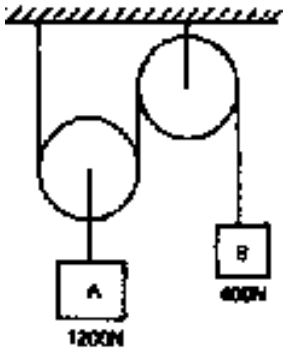
   b A stone is thrown vertically upwards with a velocity of 29.4 m/s from the top of a tower 34.3 m high. Find the total time taken by the stone to reach the foot of the tower. 4M

(OR)

9. On turning a corner, a motorist rushing at 20 m/s, finds a child on the road 50 m ahead. He instantly stops the engine and applies brakes, so as to stop the car within 10 m of the child. Calculate (i) retardation, and (ii) time required to stop the car. 12M

UNIT-V

10. 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. 12M



(OR)

11. An elevator of mass 2500 kg is moving vertically downwards with a constant Acceleration. Starting from rest, it travels a distance of 35 m during an interval of 10 seconds. Find the cable tension during this time. Neglecting all other resistances to motion, what are the limits of cable tension? 12M

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