

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

I B.Tech II Semester Supplementary Examinations, August-2017

**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) i) Perform $(-80) + (+70)$ using 2's complement. **8M**
 ii) Subtract $101011 - 111001$ using 1's complement.
 iii) Subtract $1011.001 - 110.10$ using 1's complement.
- b) i) Represent the decimal number 6027 in i) BCD ii) Excess-3 **6M**
 code & iii) 2421
 ii) What is meant by self complementing codes and give some examples of self complementing codes.

(OR)

2. a) The message below coded in the 7-bit hamming code is **8M**
 transmitted through a noisy channel. Decode the message
 assuming that at most a single error occurred in each code
 word 1001001, 0111001, 1110110, & 0011011
- b) Convert the following binary numbers to gray code numbers. **6M**
 i) 01101
 ii) 11011

UNIT-II

3. a) Obtain the simplified expressions in SOP for the following **7M**
 Boolean functions
 i) $ABD + A'C'D' + A'B + A'CD' + AB'D'$
 ii) $A + D$
- b) Use De Morgan's Theorem to complement the following **7M**
 Boolean expressions
 i) $z = xyw + y(w' + v')$
 ii) $z = (x + y)w$

(OR)

4. a) Obtain the following operations using only NOR gates **10M**
 i) AND
 ii) OR
 iii) NOT
 iv) EX-OR
 b) Consider 2-bit binary numbers say A, B and C, D. A function X is true only when the two numbers are different construct a truth table for X. **4M**

UNIT-III

5. Implement XS-3 to BCD code converter. **14M**
 (OR)
 6. Simplify the Boolean function using tabular method **14M**
 $F(A, B, C, D, E, F) = \sum(6, 9, 13, 18, 19, 27, 29, 41, 45, 57, 61, 63)$

UNIT-IV

7. a) Design Half Subtractor by using only NOR gates. **7M**
 b) Design 4-bit binary adder-subtractor circuit. **7M**
 (OR)
 8. a) Implement the following logic function using an 8X1 MUX: **7M**
 $F(A,B,C,D) = \sum m(1,3,4,11,12,13,14,15)$
 b) Realize a 2-bit comparator **7M**

UNIT-V

9. a) Distinguish between combinational and sequential circuits. **7M**
 b) Convert a J-K Flip flop into D-flip-flop **7M**
 (OR)
 10. a) Explain about Johnson counter. **4M**
 b) Design a 4-bit universal shift register **10M**

AR16

CODE: 16ME1004

SET-1

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

I B.Tech II Semester Supplementary Examinations, August-2017

ENGINEERING MECHANICS (DYNAMICS)

(Mechanical Engineering)

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

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UNIT-I

1. a A solid body formed by joining the base of a right circular cone of height H to the equal base of a right circular cylinder of height h . Calculate the distance of the centre of mass of the solid from its plane face, when $H = 120$ mm and $h = 30$ mm. 7M
 - b A body consists of a right circular solid cone of height 40 mm and radius 30mm placed on a solid hemisphere of radius 30 mm of the same material. Find the position of centre of gravity of the body. 7M
- (OR)
2. a Derive an expression for the mass moment of inertia of a cone. 7M
 - b Derive an expression for the mass moment of inertia of a sphere. 7M

UNIT-II

3. a A stone dropped into a well with no initial velocity and is heard to strike the water after 4.2 seconds. Find the depth of the well, if the velocity of sound is 330 m/sec. 7M
 - b A particle is thrown with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which will have (a) equal horizontal range, (b) equal maximum height, and (c) equal time of flight. 7M
- (OR)
4. a Two electric trains A and B leave the same station on parallel lines. The train A starts from rest with a uniform acceleration of 0.2 m/s^2 and attains a speed of 45 km/hr, which is maintained constant afterwards. The train B leaves 1 minute after with a uniform acceleration of 0.4 m/s^2 to attain a maximum speed of 72 km/hr, which is maintained constant afterwards. When will the train B overtake the train A ? 7M
 - b A stone is thrown up with a velocity of 20 m/s. While coming down, it strikes a glass pan, held at half the height through which it has risen and loses half of its velocity in breaking the glass. Find the velocity with which it will strike the ground. 7M

UNIT-III

5. a Explain the concept of D'Alembert's Principle 4M
- b A body of mass 200 kg is initially stationary on a 15° inclined plane. What distance along the incline must the body slide before it reaches a speed of 10 m/s? Take coefficient of friction between the body and the plane as 0.1. 10M

(OR)

6. a Explain the practical examples for conservation of momentum 4M
- b A hammer of mass 200 kg is made to fall freely from 2 m height on the head of a pile of 1500 kg mass. The pile is driven 5 cm into the ground in one blow. Determine (a) the common velocity of the pile and hammer after the impact (b) the energy lost in the impact and (c) the average resistance of the ground to penetration. 10M

UNIT-IV

7. a Write notes on relative velocity and instantaneous center 5M
- b A cylindrical roller, 50cm in diameter is in contact with two conveyor belts at its top and bottom as shown in fig01. If the belts run at uniform speed of 5 m/sec and 3 m/sec, find linear velocity and angular velocity of roller. 9M

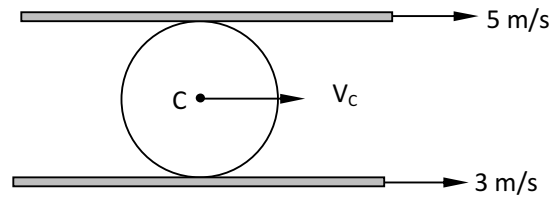


Fig.01

(OR)

8. a Explain briefly about the plane motion 4M
- b In a reciprocating pump, the lengths of connecting rod and crank is 1125 mm and 250 mm respectively. The crank is rotating at 420 r.p.m. Find the velocity, with which the piston will move, when the crank has turned through an angle of 40° from inner dead centre. 10M

UNIT-V

9. a Explain briefly about coefficient of restitution 4M
- b Three perfectly elastic balls A, B and C of masses 2 kg, 4 kg and 8 kg move in the same direction with velocities of 4 m/s, 1m/s and 0.75 m/s respectively. If the ball A impinges with the ball B, which in turn, impinges with the ball C, prove that the balls A and B will be brought to rest by the impacts. 10M

(OR)

10. a A wheel rotates for 5 seconds with a constant angular acceleration and describes during this time 100 radians. It then rotates with a constant angular velocity and during the next five seconds describes 80 radians. Find the initial angular velocity and the angular acceleration. 5M
- b A sphere of mass 1 kg, moving at 3 m/s, overtakes another sphere of mass 5kg moving in the same line at 60 cm/s. Find the loss of kinetic energy during impact, and show that the direction of motion of the first sphere is reversed. Take coefficient of restitution as 0.75. 9M

Answer ONE Question from each Unit

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UNIT-I

1. a Give the suitable derivation for the two dimensional electronic motion in a uniform electric field ? 10M
 - b Define the terms : (i) Electric field intensity (ii) Electric Potential 4M
- (OR)
2. Explain the Block diagram of CRO and how to measure frequency and phase using CRO? 14M

UNIT-II

3. a Derive the expression for position of Fermi-level in intrinsic and extrinsic semiconductors? 8M
 - b Explain diffusion and drift current for semiconductors and derive the expression for total current density? 6M
- (OR)
4. What is hall effect? Derive an expression for hall voltage? Write any two applications? 14M

UNIT-III

5. a Derive the PN Diode current equation from the quantitative theory of Diode currents? 8M
 - b Derive the expression for Diffusion capacitance of a PN Junction diode? 6M
6. a What is reverse breakdown? Explain the two breakdown mechanisms in diode? 8M
 - b A silicon diode conducts 5mA current at room temperature in forward bias condition of 0.7V. Calculate its reverse saturation current and if forward voltage is increased to 0.75V, Calculate the new current through the diode? 6M

UNIT-IV

7. a Explain the input and output characteristics of NPN Transistor in Common Base Configuration? 12M
 - b Write the relation between α , β and γ ? 2M
- (OR)
8. a With neat sketches explain the flow of different current components of a n-p-n transistor. Give their relationship. 10M
 - b What is punch through effect ? 4M

UNIT-V

9. Explain in detail about the construction details, Characteristics and different parameters of N-Channel JFET? 14M
- (OR)
10. a Explain the operation of Enhancement and Depletion mode MOSFET? 9M
 - b Explain the V-I characteristics of SCR ? 5M

ENGINEERING MECHANICS**(For CE, CSE & IT Branches)****Time: 3 Hours****Max Marks: 70M**

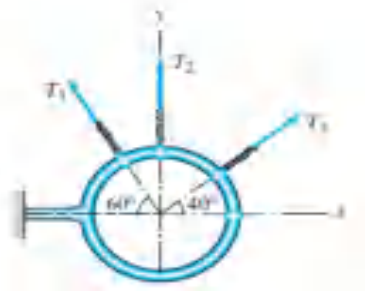
Answer ONE Question from each Unit

All Questions Carry Equal Marks

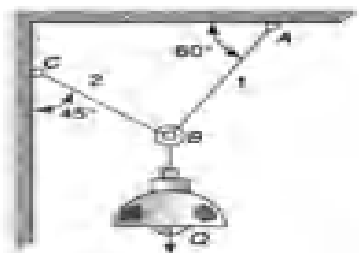
All parts of the question must be answered in one place only

UNIT-I

1. **a** Two forces act at an angle of 120° , The bigger force is of 40N and the resultant is perpendicular to the smaller one. Find the smaller one.
- b** The magnitudes of the three forces applied to the eye bolt are $T_1 = 110 \text{ N}$, $T_2 = 40 \text{ N}$, and $T_3 = 150 \text{ N}$. Replace these forces with a single equivalent force R . Show the result on a sketch of the eye bolt.

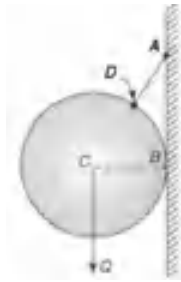
**(OR)**

2. **a** Distinguish clearly between resolution of forces and composition of forces.
- b** An electric light fixture of weight $Q = 178 \text{ N}$ is supported as shown in Figure. Determine the tensile forces S_1 and S_2 in the wires **BA** and **BC** if their angles of inclination are as shown.



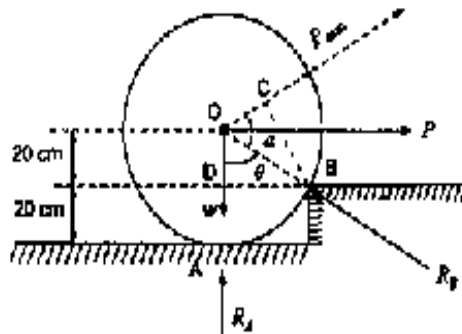
UNIT-II

3. a State and explain Lami's theorem.
- b A ball of weight Q and radius r is attached by a string AD to a vertical wall AB , as shown in Fig. Determine the tensile force S in the string and the reaction R_b against the wall at B if $Q = 60 \text{ N}$, $r = 75 \text{ mm}$, $AB = 100 \text{ mm}$. Neglect friction at wall.



(OR)

4. A roller of radius 40 cm weighing 4000 N is to be pulled over a rectangular step of height 20 cm by a horizontal force P applied at the centre of the roller (Fig). Find P . What is the least value of P and its direction in order to lift the roller over the step? P acts at the same point.

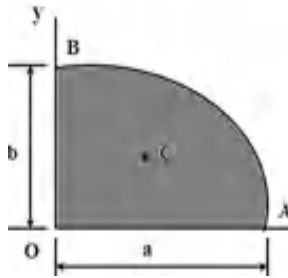


UNIT-III

5. A ladder 5m long and 250N weight is placed against a vertical wall in a position where its inclination to the vertical is 30° . A man weighing 800N climbs the ladder. At what position will he induce slipping? The coefficient of friction for both the contact surfaces of the ladder i.e., with the wall and the floor is 0.2.

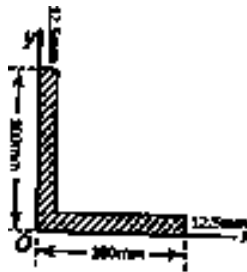
(OR)

6. Determine the coordinates X_c and Y_c of the centroid C of the area of one quadrant of an ellipse OAB with major and minor semi axes **a** and **b**, respectively.



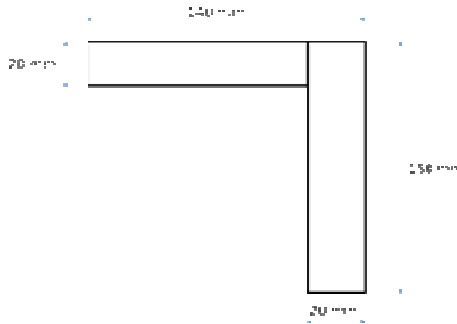
UNIT-IV

7. Calculate the Moment of Inertia of angle section about X – axis.



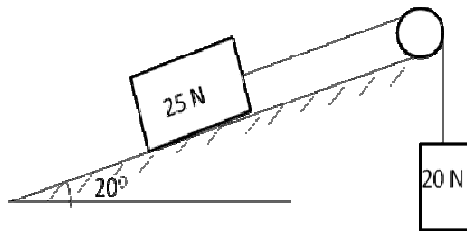
(OR)

8. Find the moment of inertia of the area of L-section as shown in Fig. about the centroidal x and y- axis.



UNIT-V

9. Two bodies weighing 25N and 20 N are connected to the ends of an inextensible string, which passes over a smooth pulley. The weight 25 N is placed on a smooth inclined plane while the weight 20 N is hanging over the pulley. Determine (i) Acceleration of the system when 25 N moves up (ii) Tension in the string.



(OR)

10. A two step pulley supports two weights P and Q as shown in figure. Find the downward acceleration of P. Assume $P = 40 \text{ N}$, $Q = 60 \text{ N}$ and $r_1 = 2r_2$. Neglect friction and inertia of the pulleys.

