Khulna University of Engineering & Technology
Department of Industrial Engineering and Management
B.Sc. Engineering 2nd Year 1st Term Regular Examination, 2015
CSE 2111
Data Structures and Algorithms

Full Marks: 210   Time: 3 hrs

N.B: i) Answer any THREE questions from each section in separate scripts.
         ii) Figures in the right margin indicate full marks.
         iii) Assume reasonable data if missing any.

SECTION–A

1. (a) What is meant by data structures? Explain the basic operations of data structure(s).   10
   (b) Give the basic difference between dynamic and static memory allocation.   08
   (c) Write a procedure to find the sum of the following series using recursion.   12
   $1 + 2 + 3 + 4 + \ldots\ldots\ldots\ldots..+n$
   (d) How can array be represented in memory?   05

2. (a) What do you mean by complexity of an algorithm? Explain complexity of binary search algorithm.   10
   (b) Write down the selection sort algorithm which sorts the array A with N elements.   13
   (c) Write a procedure to copy a string without using the predefined function.   12

3. (a) What are the differences between stack and queue?   06
   (b) Briefly explain the following terms-   12
        i)   Push   ii) Pop   iii) Over flow   iv) Under flow
   (c) Consider the following arithmetic infix expression Q.   17
   $Q: \left(A + {}^{B}/_{C} \uparrow D\right) * E - (F * G - H) \uparrow I$
   Translate the above expression into its equivalent postfix expression P.

4. (a) What is meant by two-way linked list?   05
   (b) Write down the difference between array of structure and linked list.   10
   (c) Write an algorithm which can create a tow-way linked list.   10
   (d) Write an algorithm that can delete a node from any position of a two-way linked list.   10

SECTION–B

5. (a) What is tree? Explain the terms node, siblings, path, leaf and depth.   10
   (b) What is binary search tree? Construct a binary search tree with following numbers and delete 56 from the tree; 38, 14, 56, 45, 8, 23, 82, 70 and 18   12
   (c) Draw the tree from following traversing.   13
   Preorder: ABDEFCGHJLK
   In order: DBFE AGCL JHK

6. (a) What is heap? Write down the difference between binary tree and binary search tree.   10
   (b) Describe the deletion of a node having two children in binary search tree.   12
   (c) Explain the necessity of graph. Define the following terms-   13
        i)   Edge   ii) Neighbor   iii) Connected graph   iv) Loop

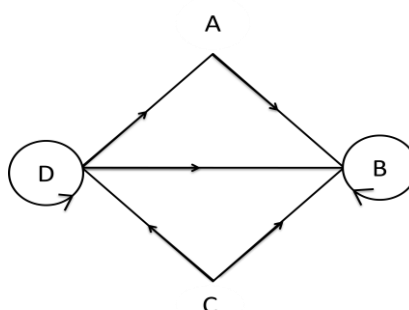7. (a) Construct adjacency matrix and find path matrix from the following figure.   16

Fig. 7(a)

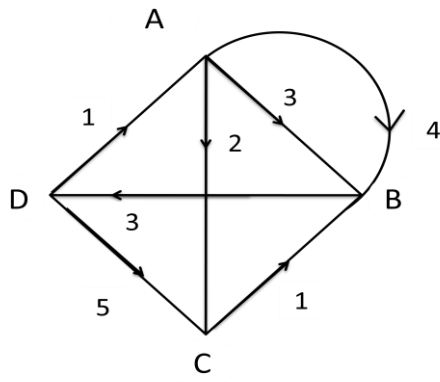(b) Find weight matrix and find shortest path matrix from the following figure.   19

Fig. 7(b)

8. (a) Searching technique, called hashing, is independent of number. Explain it.   10
   (b) The keys for five students are 1311009, 1311010, 1311011, 1311012 and 1311013. Develop   12
   hash function and evaluate H(k).
   (c) What is collision? Explain some collision resolution methods.   13

Khulna University of Engineering & Technology
Department of Industrial Engineering and Management
B.Sc. Engineering 2nd Year 1st Term Regular Examination, 2015
EEE 2111
Electrical Circuits and Machines

Full Marks: 210   Time: 3 hrs

N.B: *i) Answer any THREE questions from each section in separate scripts.*
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if missing any.

SECTION–A

1. (a) Define the terms (i) Junction points (ii) Passive network (iii) Active network (iv) Branch and (v) Mesh.   10
   (b) State and explain KVL and KCL.   06
   (c) Find the current I_0 of the network shown in fig 1(c) by using $Y/_\Delta$ conversion.   12
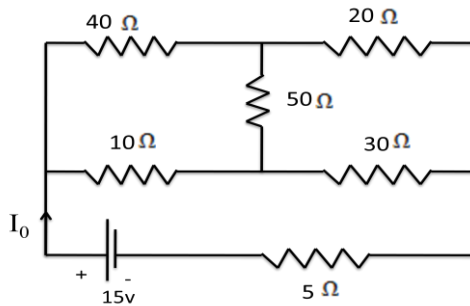

Fig. 1 (c)

   (d) Derive the condition under which a load will absorb maximum power from dc source.   07

2. (a) State and explain Ohm's law.   04
   (b) State superposition theorem. Using the theorem, find the current through 10 Ω resistance of the circuit shown in fig 2 (b).   14

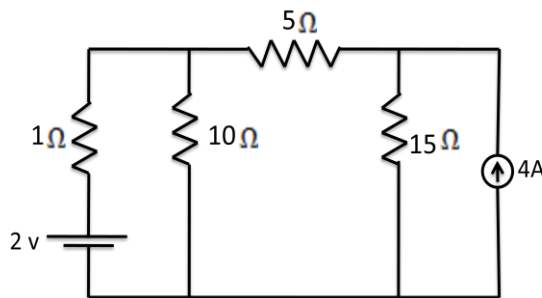Fig. 2 (b)

   (c) By using Thevenin's theorem replace the network shown in fig 2(c) with reference to terminals A and B.   13
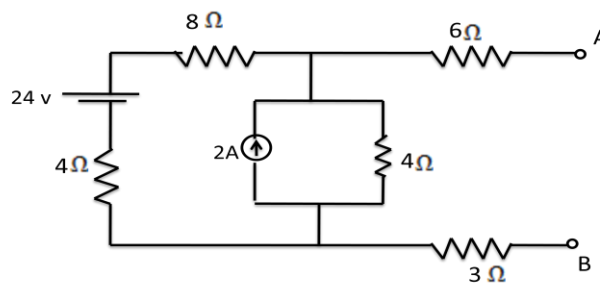

Fig. 2(c)

   (d) Define unilateral and bilateral circuits.   04

3. (a) What are the basic requirements for the generation of e.m.f.   03
   (b) Write short notes on ; (i) Yoke (ii) Pole (iii) brush and commutator   09

(c) Write down the principle of operation of a dc generator. How dc current is obtained from ac current?   13

(d) Draw the power stage diagram of a dc motor. Derive the equation of generated e.m.f of a generator.   10

4. (a) What do you mean by back e.m.f? Write down its significance. Also write down the working principle of a three point starter. How a four point starter can overcome the limitation of three point starter?   15

(b) A shunt generator delivers 195 A at terminal voltage of 250 V. The armature resistance and shunt field resistance are 0.02 Ω and 50 Ω respectively. The iron and friction losses equal 950 W. Find, (i) E.M.F. generated (ii) Cu losses (iii) Output of the prime motor and (iv) Commercial, mechanical and electrical efficiencies.   10

(c) Write down the working principle of a 3-phase synchronous motor.   10

SECTION–B

5. (a) What is phase? Find the angle of phase difference between $v = 100\cos(wt - 30^0)$ and $i = -10\sin(\omega t - 60^0)$. Which wave lags?   05

(b) Define impedance. Show that at no time does the power in a phase resistance reach negative values.   06

(c) Deduced an expression of impedance, real power, reactive power, average power and instantaneous power of a R-L series circuit.   15

(d) R = 10 Ohms and L = 0.05 henry are connected in series and energized by a 25-cycle sinusoidal voltage. The maximum value of which is 150 volts.   09

     i)   Find the complete impedance for RL branch.

     ii)   Write the expression of supply voltage making $v = 75$ $(dv/dt + ve)$ at t = 0.

     iii)   Write the expression of circuit as a function of time.

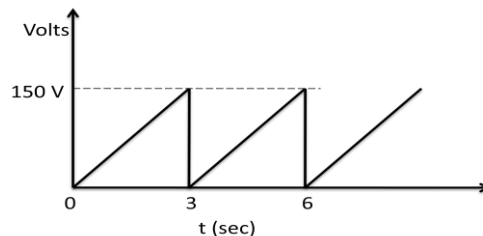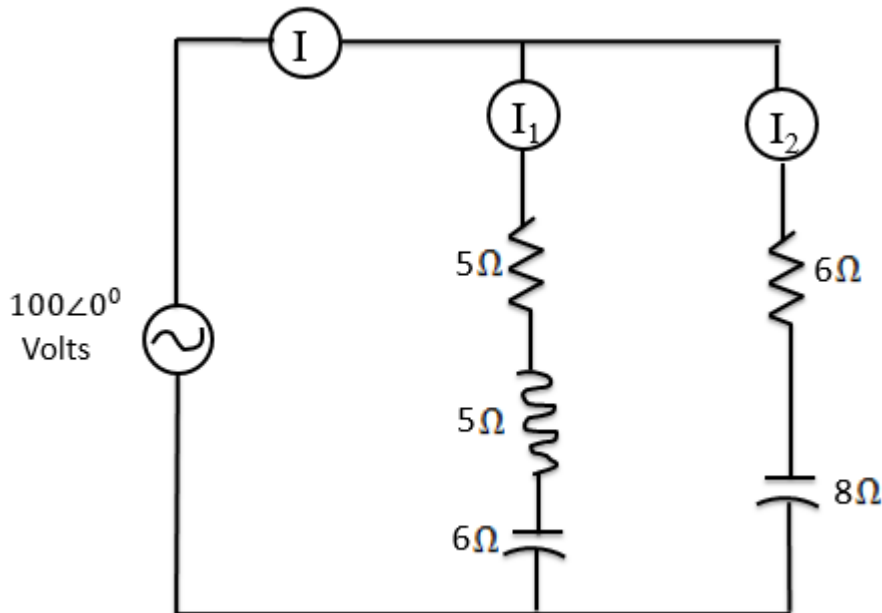6. (a) Define form factor and crest factor. Find the factor for the sawtooth wave shown in Fig. 6 (a)   08

Fig. 6 (a)

(b) What is phasor? Write the significance of operator j. Express the following as a single complex number.   07

$$\sqrt[3]{4.5 - j7.79} + \log_e^{10\angle172^0}$$

(c) Calculate the real power and reactive power by employing complex forms. If $v = 200\angle30^0$ and $I = 10\angle60^0$, find real power and reactive power.   10

(d) Show that $W_L = \frac{1}{2}LI_m^2$ and $W_C = \frac{1}{2}CV_m^2$, where symbols have their usual meanings.   10

7. (a) Describe the working principle of a single phase transformer and also draw the equivalent circuit of the transformer.   12

   (b) What are the losses in a transformer? Briefly explain the open circuit and short circuit tests of a transformer.   13

   (c) Derive e.m.f equation of a transformer. Describe transformer (i) on no-load (ii) on load. Draw necessary vector diagrams.   10

8. (a) Why does rotor rotate in 3-φ induction motor?   08

   (b) Derive the torque of an induction rotor under running conditions; Find the relation between torque and slip. Draw necessary curves.   10

   (c) How rotating field is produced in a three-phase IM?   09

   (d) A three phase induction motor supplied from a 50 Hz, 400 V supply. The motor has 6-pole. Calculate: 08

        i)   The synchronous speed.

        ii)   The speed of the rotor when the slip is 4%.

Khulna University of Engineering & Technology
Department of Industrial Engineering and Management
B.Sc. Engineering 2nd Year 1st Term Regular Examination, 2015
HUM 2111
Financial, Cost and Management Accounting

Full Marks: 210   Time: 3 hrs

N.B: i) *Answer any THREE questions from each section in separate scripts.*
          ii) *Figures in the right margin indicate full marks.*
          iii) *Assume reasonable data if missing any.*

SECTION–A

1. (a) Define accounting. Discuss the objectives of accounting.   10
   (b) Define accounting equation. Describe the elements of accounting equation.   12
   (c) Describe the rules for determining debit and credit by using accounting equation and golden rules.   13

2. (a) What is the purpose of ledger? How does journalizing differ from ledger?   10
   (b) Juli Brown started her own consulting firm on July 1, 2014. The following transactions occurred during the month of July: 25
   2014
   July-1   Invested Tk 1, 40,000 cash in the business.
   ”   3   Paid Tk 16000 for office rent for the month.
   ”   5   Performed services Tk 66000 on account.
   ”   10   Purchased office equipment for Tk 48000 on account.
   ”   12   Paid Tk 1000 for the advertise in the Daily News.
   ”   15   Paid Tk 50000 for employees' salaries for the month.
   ”   17   Received Tk 20000 cash for service provided.
   ”   19   Paid for the equipment purchased on account on July 10.
   ”   22   Withdraw Tk 14000 cash for personal use.
   ”   25   Paid Tk 3000 for utility expense.
   ”   27   Received cash for service provided on account July 5 Tk 50000
   ”   30   Borrowed Tk 100,000 from the Bank on a note payable.
   ”   31   Purchased other equipment for cash Tk 52000.
   Required: Journalize above the transaction in the book of Juli Brown.

3. (a) Define Trial Balance. What are the basic difference between Trial Balance and Balance sheet?   10
   (b) Discuss the importance of Trial Balance. What are the errors not detected by a Trial Balance?   15
   (c) What is adjusting Journal? Describe the necessity of adjusting entries.   10

4. Mr. Turjo began operation as a private service named "Turjo Agency" on January 1, 2014. The trial balance of Turjo Agency at December 31, 2014 are as follows: 35

Trial balance
December 31, 2014

Account title	Debit	Credit
Cash	Tk 25,000	
Account receivable	11,000	
Supplies	2,000	
Prepaid Insurance	4,800	
Office Equipment	56.000	
Notes payable		Tk 20,000
Turjo capital		40,000
Turjo Drawing	3,400	
Account payable		24,000
Fees earned		26,000
Salaries expense	2,800	
Travelling expense	2,200	
Rent expense	2,000	
Miscellaneous expense	800	
	1,10,00	1,10,00

Adjustments:
- (i) Insurance expired at the rate Tk. 300 per month.
- (ii) Fees earned but unbilled at December 31, total Tk. 2,100.
- (iii) Interest payable on notes payable Tk. 1000.
- (iv) Supplies on hand Tk. 600.
- (v) Depreciation charged on office equipment @ 5% p.a.

Instructions: Statement of comprehensive income (income statement) ; Owner's equity statement and statement of financial position (Balance sheet) as on December 31, 2014.

SECTION–B

5. (a) What are the difference between financial accounting and cost accounting? 10
   (b) From the following particulars of Rupsha manufacturing, you are required to prepare a cost sheet. Showing cost of raw materials used; prime cost; works cost; cost of goods manufactured; cost of goods sold; total cost and sales: 25

Inventories at beginning :	Taka
Raw materials	24,200
Work-in-progress	20,400
Finished goods	26,000
Direct wages	38,400
Raw materials purchased	62,800
Factory overhead :	2/3rds of direct wages.
Administrative expenses :	20% of works cost.
Selling expenses :	5% of sales
Profit :	15% of sales
Inventories at end :	
Raw materials	18,000
Work-in-progress	15,200
Finished goods	30,000

6. (a) What is payroll account? What are the primary sources of gross earning? 10
   (b) What are the benefits under consider wages and salaries? 05
   (c) Three employees worked in Account section of Western Company. Information relating salaries for the month of June, 2015 as follows: 20

Particulars	Name of the employees		
	Firoz	Shawpan	John
Basic Salaries (Tk)	12,000	9,000	7,200
House rent (% of basic salaries)	50%	50%	50%
Dearness allowance (% of basic salaries)	20%	20%	20%
Medical allowance (Tk)	800	800	800
Charge allowance (Tk)	1,500	-	-
Overtime (Hours)	20	25	30
Employees contribution to provident fund (% of basic salaries)	10%	10%	10%
Contribution to benevolent fund (Tk)	200	100	100

During the month, normal working hours were 200 hours. Overtime allowance $1\frac{1}{2}$ of the basic salary per hour. Deduct from Mr. John for computer loan yearly amount Tk. 3,600 and Mr. Shawpan enjoy 2 days leave without salary.
Instruction: Prepare payroll sheet for the month of June, 2015.

7. (a) What is a budget? How does a budget contribute to good management? 10
   (b) Show the classification of budget. 10
   (c) Andrew Manion company has credit sales $500,000 in January. Past experience suggests that 45% is collected in the month of sale. 50% in the month following the sale, and 4 % in the second month following the sale. Compute the cash collections from January sales in January, February and March. 15

8. (a) What is semi variable cost? 05
   (b) Fixed cost per unit is variable and variable cost per unit is fixed-Explain. 10

(c) Following information of Ureka manufacturing co.:   20

    Raw materials per unit   Tk. 16

    Wages per unit   Tk. 14

    Factory overhead per unit   Tk. 16

    Selling price per unit   Tk. 60

    Fixed cost   Tk. 2,10,000

    Actual sales   46,000 units

Required:

    (i)   Variable cost per unit.

    (ii)   Contribution margin per unit.

    (iii)   Break even sales in units.

    (iv)   Margin of safety.

Khulna University of Engineering & Technology
Department of Industrial Engineering and Management
B.Sc. Engineering 2nd Year 1st Term Regular Examination, 2015
Math 2111
Mathematics III

Full Marks: 210   Time: 3 hrs

N.B: i) *Answer any THREE questions from each section in separate scripts.*
ii) *Figures in the right margin indicate full marks.*
iii) *Assume reasonable data if missing any.*

SECTION–A

1. (a) Define complex variable and function of complex variable. What is Argand diagram? Describe geometrically the region which the inequality $1 < |z + i| \le 2$ represents in the Argand's diagram. **12**

  (b) Prove that $\lg\left(\frac{x+iy}{x-iy}\right) = 2i\tan^{-1}\frac{y}{x}$ and hence evaluate $\cos[i\log\left(\frac{x+iy}{x-iy}\right)]$. **10**

  (c) Is the function $u = \frac{x-y}{x^2+y^2}$ harmonic? If so find the corresponding analytic function f(z) such that f(z) = u + iv. **13**

2. (a) Explain the followings; i) Entire functions ii) Closed set, and iii) Contour. **09**

  (b) Prove that the function f(z) defined by $f(z) = \begin{cases} \frac{(x^3-y^3)+i(x^3+y^3)}{x^2+y^2} & ;z \ne 0 \\ 0 & ;z = 0 \end{cases}$ is continuous and the Cauchy-Riemann equations are satisfied at the origin. Does $f'(0)$ exist? **15**

  (c) State Green's theorem and use this theorem to evaluate $\int_C (3x - 8y^2)dx + (4y - 6xy)dy$, where C is the boundary of the region bounded by $x = 0, y = 0$ and $x + y = 1$. **11**

3. (a) Evaluate the integral $\oint_C \frac{z^2-2z}{(z+1)^2(z^2+9)}dz$ using suitable theorem, where C is **18**

  i) The circle $|z| = 5$,

  ii) A square with vertices $2 \pm 2i, -2 \pm 2i$, and give the statement of the theorems you applied.

  (b) Obtain the expansion of $\frac{z-1}{z^2}$ in a Taylor's series about $z = 1$. **08**

  (c) Expand $f(z) = \frac{2z+3}{(z-1)(z-2)}$ in a Laurent series in the region (i) $1 < |z| < 2$ and (ii) $0 < |z - 1| < 1$. **09**

4. (a) What types of singularities the following functions have? **05**

  (i) $\frac{e^{2z}}{(z-1)^4}$ (ii) $\frac{e^{\frac{1}{z}}}{z^2-z-6}$

  (b) Evaluate any two of the followings integral; **30**

  (i) $\int_0^{2\pi} \frac{d\theta}{5+4\cos\theta}$ (ii) $\int_0^\infty \frac{x\sin x}{x^2+a^2}dx$ (iii) $\int_{-\infty}^\infty \frac{x^2}{(x^2+4)(x^2+9)}dx$

SECTION–B

5. (a) Define order and degree of a differential equation with examples. Find a differential equation of all circles passing through the origin and having centres on the x axis. **12**

  (b) Solve $\frac{dy}{dx} = (2x + 3y - 5)^2$. **08**

  (c) Using the method of separation of variables solve the one dimensional wave equation subject to the boundary conditions $\frac{\partial^2 U}{\partial t^2} = C^2 \frac{\partial^2 U}{\partial x^2}$ where $U(0,t) = U(1,t) = 0$ and $U(x, 0) = \lambda\sin\pi x$, $Ut(x, 0) = 0$. **15**

6. (a) Solve $y^2 dx + (x^2 - xy + y^2)dy = 0$ **10**

  (b) Solve $(x^3 + xy^4)dx + 2y^3 dy = 0$ **15**

  (c) Find $L\{\bar{e}^x x \cos 2x\}$ **10**

7. (a) Solve $y'' - 3y' + 4y = \cos(4x + 5)$ 10

   (b) Solve by the method of variation of parameter, $\frac{d^2y}{dx^2} + 4y = \tan 2x$.   13

   (c) Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 4y = 2x^2 + 3e^{-x}$ by the method of undetermined coefficients.   12

8. (a) Find $L^{-1}\{\frac{3}{4s^2+9}\}$.   08

   (b) State convolution theorem. Use it to find the inverse transform of $\frac{S}{(S^2+a^2)^2}$.   12

   (c) Using Laplace theorem, solve $(D^3 - 3D^2 + 3D - 1)y = t^2e^t$, given that $y(0) = 1, y'(0) = 0, y''(0) = -2$.   15

Khulna University of Engineering & Technology
Department of Industrial Engineering and Management
B.Sc. Engineering 2nd Year 1st Term Regular Examination, 2015
ME 2111
Engineering Mechanics and Theory of Machines

Full Marks: 210   Time: 3 hrs

N.B: i) Answer any THREE questions from each section in separate scripts.
   ii) Figures in the right margin indicate full marks.
   iii) Assume reasonable data if missing any.

SECTION–A

1. (a) The three forces shown in figure 1 (a) and a couple of moment M = 6 N.m and applied to   17
an angle bracket. (i) Find the resultant of this system of forces. (ii) Locate the points where
the line of action of the resultant intersects line AB and line BC.
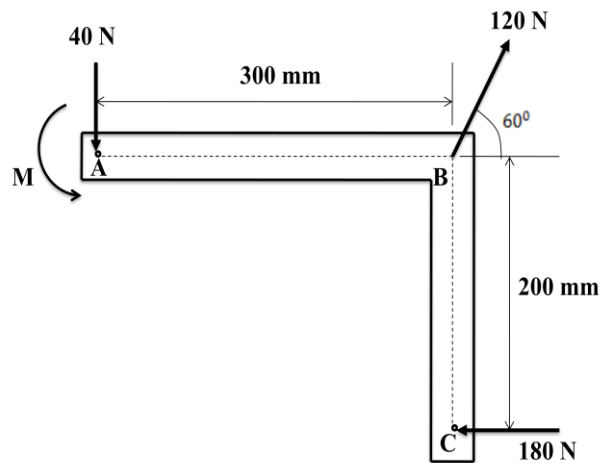
Fig. 1 (a)

(b) A uniform rod AB of length 2R rests inside a hemispherical bowl of radius R as shown in   18
figure 1 (b). Neglecting friction, determine the angle θ, corresponding to equilibrium.
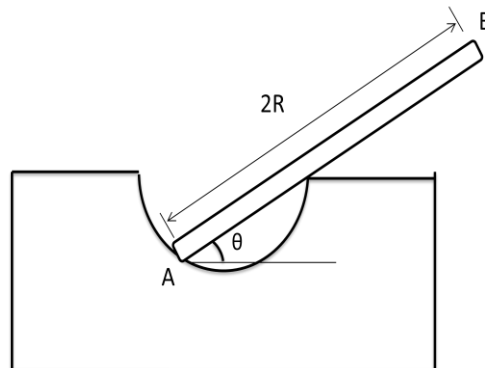
Fig. 1 (b)

2. (a) Determine the moment of inertia of a right circular cone with respect to (i) its longitudinal   19
axis, (ii) an axis perpendicular to its longitudinal axis.
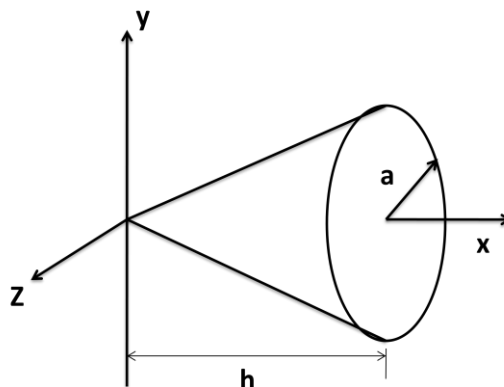

Fig. 2(a)

(b) Determine the centroid of the area shown in fig. 2 (b).   16
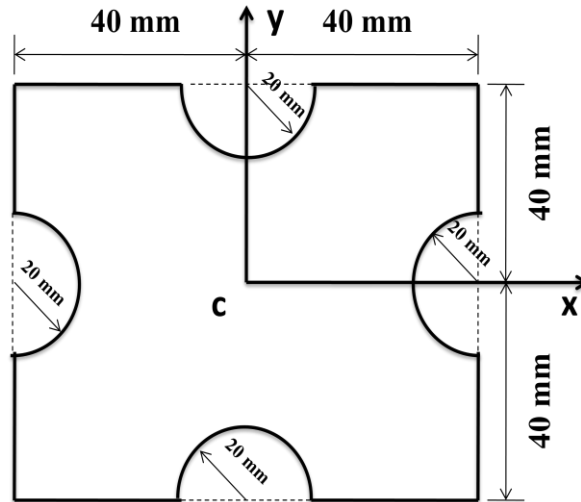

Fig. 2 (b)

3. (a) What is the law of friction? For which purpose a wedge can be used? Deduce the   17
         expression for a flat belt, $T_2/T_1 = e^{\mu_s \beta}$, where β is the angle of contact and other symbols
         have their usual meanings.

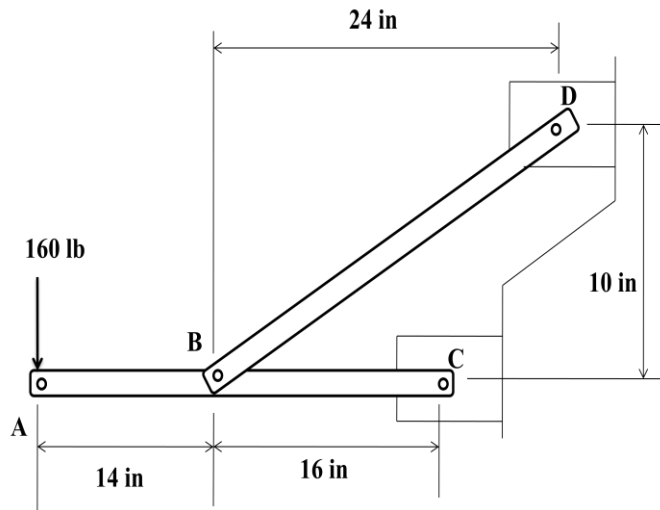   (b) Determine the force in member BD and the components of the reaction at C.   18

Fig. 3 (b)

4. (a) Determine the components of the forces acting on each member of the frame shown in   18
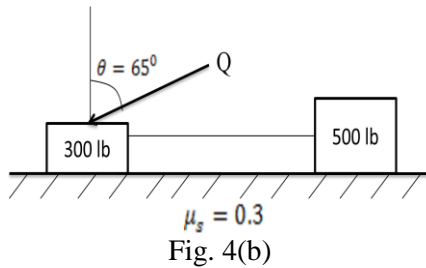   figure 4 (a)
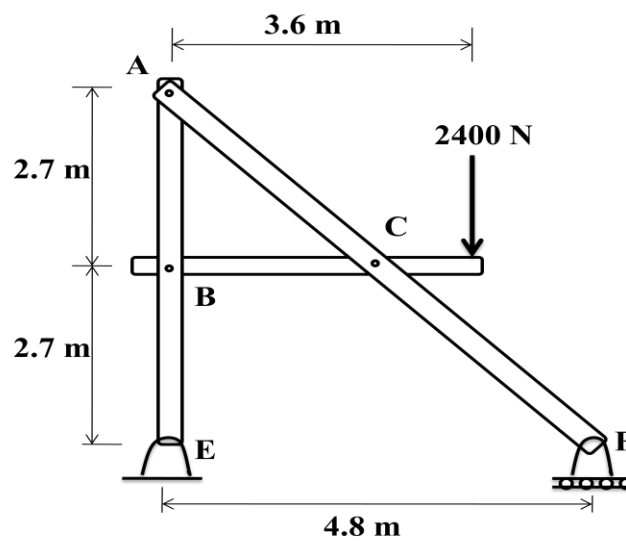
Fig. 4 (a)

    (b) Two blocks are connected by a cable as shown in figure 4 (b). Determine the force Q   17
         required to move the body towards left.

$\theta = 65^0$

Q

300 lb

500 lb

$\mu_s = 0.3$

Fig. 4(b)

SECTION–B

5. (a) A single wire ACB passes through a ring at C attached to a sphere which revolves at the constant speed V in the horizontal circle shown in figure 5 (a). Knowing that the tension is the same in both portions of the wire. Determine the speed V.   17
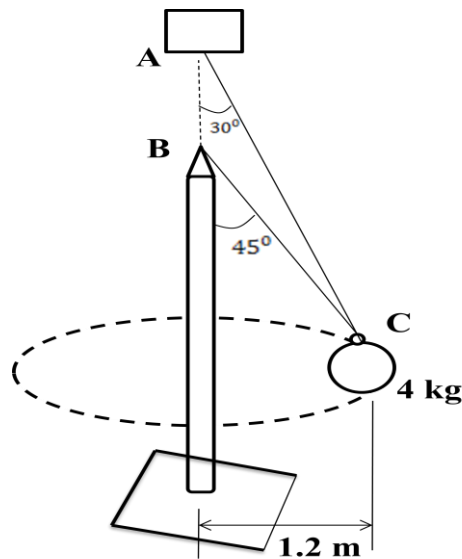

A

30^0

B

45^0

C

4 kg

1.2 m

Fig. 5 (a)

(b) A 20-lb collar slides without friction along a vertical rod as shown in figure 5 (b). The spring attached to the collar has an undeformed length of 4 in and a constant of 3 lb/in. If the collar is released from the rest in position 1, determine its velocity after it has moved 6 inch to position 2.   18
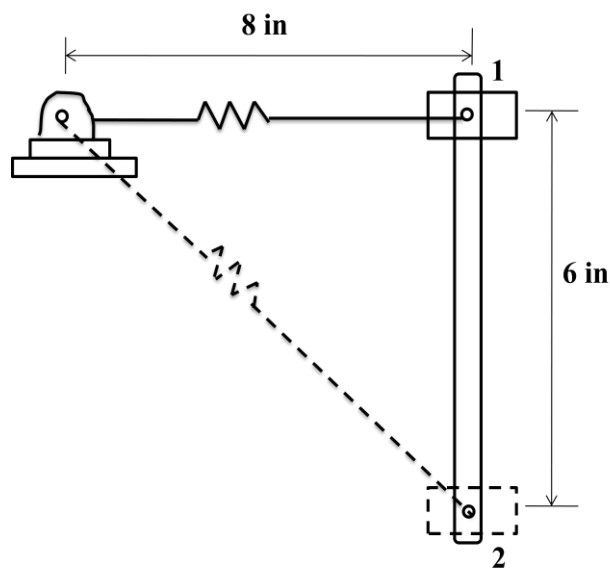

8 in

1

6 in

2

Fig. 5 (b)

6. (a) A uniform rod BC of mass 3 kg is connected to a collar A by a 0.2 m cord AB shown in figure 6 (a). Neglecting the mass of the collar and cord, determine (i) The smallest constant acceleration a_A, for which the cord and the rod lie in a straight line, (ii) The corresponding tension in the cord.   17
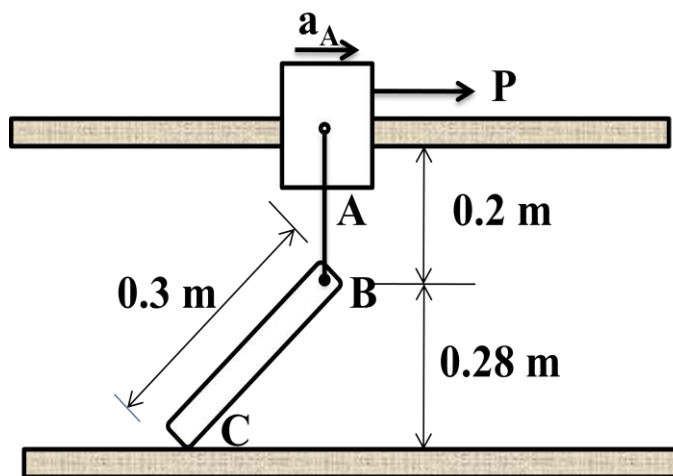
Fig. 6 (a)

(b) The 10 lb slender rod AB is welded to the 6 lb uniform disk which rotates about a pivot at A. A spring of constant 0.625 lb/in is attached to the disk and is unstretched when rod AB is horizontal. Determine the required angular velocity of the assembly when it is in the position shown in the following fig, if its angular velocity is to be 8 rad/s, after it has rotated through 90^0 clockwise.   18
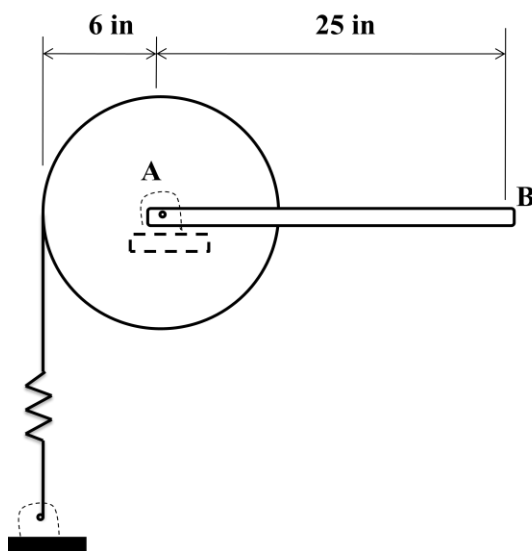

Fig. 6 (b)

7. (a) Why balancing of rotating parts is necessary for high speed engines?   05
   (b) For direct central impact, show that the co-efficient of restitution is equal to the ration of the relative velocity of two particles after and before impact.   15
   (c) Four masses A, B, C, and D revolve at equal radius and are equally spaced along a shaft. The mass B is 7 kg and the radius of C and D makes angle of 90^0 and 240^0 respectively with the radius B. Find the magnitude of masses A, C and D. And the angular position of A so that the system may be completely balanced.   15

8. (a) Define: Critical Speed, Viscous Damping, Damping Ratio, and Logarithmic Decrement.   08
   (b) Show that the critical speed of a shaft is same as the natural frequency of free transverse vibration.   15
   (c) An instrumental vibrates with a frequency of 1 Hz when there is no damping. When the damping is provided, the frequency of damped vibrations was observed to the 0.9 Hz. Find (i) The damping factor   (ii) Logarithmic decrement.   12