

K. J. Somaiai College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)
 Semester: January 2018 - May 2018

Max. Marks: 100**Duration: 3 Hrs****End Semester Exam**

Class: F.Y.B.Tech

Semester: II

Name of the Course: Applied Mathematics-II

Branch: ALL

Course Code: USHC102

Instructions:

- (1) All Questions are Compulsory
- (2) Figures to right indicate full marks. Each sub-question has equal marks.

Question No.		Max. Marks
Q.1	A Attempt the following:	18
	Evaluate: $\int_{-\pi}^{\pi} \sin^2 x \cos^4 x dx$	
	B Attempt any THREE of the following:	
	(a) Show that: $\int_0^1 \sqrt{1 - \sqrt{x}} dx \cdot \int_0^{1/2} \sqrt{2y - 4y^2} dy = \frac{\pi}{30}$.	
	(b) Prove $ n+1 = n n $. Hence Find value of $ -2.4 $ if $ 1.6 = 0.8935$.	
	(c) Using Beta-Gamma functions, prove that $\int_0^{\infty} x e^{-ax} \sin(bx) dx = \frac{2ab}{(a^2+b^2)^2}$	
	(d) Prove that: $\int_3^7 \sqrt[4]{(x-3)(7-x)} dx = \frac{2(\sqrt[4]{1/4})^2}{3\sqrt{\pi}}$.	
	(e) Show that: $\int_0^{\infty} \frac{e^{-x} - e^{-ax}}{x \sec x} dx = \frac{1}{2} \log\left(\frac{a^2+1}{2}\right)$, $a > 0$.	
Q.2	A Attempt the following :	24
	Solve: $(D^4 - 1)y = 0$.	
	B Attempt any FOUR of the following:	
	(a) Solve: $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$.	
	(b) Solve: $\frac{dy}{dx} + x(x+y) = x^3(x+y)^3 - 1$.	
	(c) Solve: $(D^2 - 3D + 2)y = x^2 e^{2x}$.	
	(d) Solve: $(x^2 D^2 + 4xD + 2)y = \sin x$.	
	(e) Using the method of undetermined coefficients, solve $(D^3 - D^2)y = \sin x + e^x$.	
(f)	Solve $(D^2 - 2D + 1)y = \sin h 2x \cosh 3x + x$	

Q.3	A	Attempt the following:	04
		Solve $\frac{dy}{dx} = x - y^2$ with $y(0) = 1$ by Euler's method to determine the value of y for $x = 0.1$ by taking $h = 0.02$ correct to four decimal places.	
	B	Attempt any TWO of the following:	
	(a)	Apply Runge-Kutta of fourth order to find y at $x = 0.2$. Given $\frac{dy}{dx} + y + xy^2 = 0$, $y(0) = 1$, $h = 0.1$.	
	(b)	The Differential equation of a body projected vertically upwards in air is given by $\frac{dv}{dt} = -g - kv$. Show that the distance travelled by a particle at time t is given by $x = \left(\frac{g}{k^2} + \frac{u}{k}\right)(1 - e^{-kt}) - \frac{g}{k}t$ where u is the initial velocity.	
	(c)	In a circuit in which self inductance and capacitor neutralize each other, the current satisfies the differential equation $L \frac{di}{dt} + \frac{1}{C} \int i dt = 0$. Find the current i at time t if initial current is 0 and maximum current is i_0 .	12
Q.4		Attempt any ONE of the following:	06
	(a)	Find the length of one arc of the cycloid $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$	
	(b)	Find the total length of the parabola $x^2 = 4y$ which lies inside the circle $x^2 + y^2 = 6y$.	
Q.5	A	Attempt the following:	04
		Sketch the region of integration and evaluate: $\int_0^1 \int_{x^2}^x xy(x+y) dy dx$.	
	B	Attempt any FOUR of the following:	24
	(a)	Find the mass of lamina bounded by curves $y^2 = ax$ and $x^2 = ay$ if the density of the lamina at any point varies as the square of its distance from origin.	
	(b)	Evaluate $\iint_R r dr d\theta$ where R is the region common to the circles $r = a \cos \theta$ & $r = a \sin \theta$.	
	(c)	Evaluate the integral $\iiint xyz^2 dv$ over the region bounded by the planes $x = 0, x = 1, y = -1, y = 2, z = 0$ & $z = 3$.	
	(d)	Express as a single integration and then evaluate: $\int_0^1 \int_0^y (x^2 + y^2) dx dy + \int_1^2 \int_0^{2-y} (x^2 + y^2) dx dy$.	
	(e)	Find the volume bounded by the cylinder $x^2 + y^2 = a^2$ and the planes $y + z = 2a$ & $z = 0$.	

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End Semester Exam
 May – June 2018

Max. Marks: 75

Class: F.Y.B.Tech.

Name of the Course: Applied Chemistry -II

Course Code: USHC203

Duration: 2Hr30Min

Semester: II

Branch: All

Instructions:

- (1) All Questions are Compulsory
- (2) Draw neat diagrams
- (3) Assume suitable data if necessary
- (4) Atomic weights: C=12, O = 16, S = 32, Au = 197, Ag = 108, Cu = 63.5, K = 39, N = 14, Zn = 65

Question No.		Max. Marks
Q 1 (a)	Attempt any THREE. <ol style="list-style-type: none"> i) Explain caustic embrittlement with respect to the following points a) Type of corrosion b) Process c) Chemical Reactions d) Electrochemical cell representation d) Prevention of Caustic embrittlement. ii) In an electrolysis experiment, a current was passed for 7 hours through two cells connected in series. The first cell contains a solution gold salt and the second cell contains Zinc sulphate solution. 8.85 g of gold was deposited in the first cell. If the oxidation number of gold is +3, find the amount of Zinc deposited on the cathode in the second cell. Also calculate the magnitude of the current in ampere. iii) With the help of neat labelled diagram explain effect of O₂ supply on corrosion product in the rusting of iron in neutral aqueous solution (Absorption of O₂ Type). iv) Distinguish between Cathodic protection and Anodic protection (Five Points). 	15
Q2 (a)	Attempt any TWO. <ol style="list-style-type: none"> i) Define Octane Number, Cetane Number, Knocking. Select the compound which has the highest octane number and highest cetane number out of n-heptane, n-hexadecane, n-octane, iso-octane. ii) What is TEL; Give its preparation, properties and disadvantages? Explain TEL Scavenger? iii) Explain how Nitrogen can be estimated in coal with the help of suitable diagram. 	10
Q2 (b)	Attempt the following. <ol style="list-style-type: none"> i) The composition of gas was found to be, H₂ = 10%, CH₄ = 16%, C₂H₆ = 20%, N₂ = 6%, CO=22%, CO₂ =18%, O₂ = rest. Calculate weight and volume of air required for complete combustion of 10m³ of this gas. ii) A sample of coal requires 25% excess air for complete combustion. Calculate weight and volume of air for 250gm of the coal, if the composition is C =78%, H =4%, N =1.5%, S =1.5%, Ash = 9.3%. 	10

Q3	<p>Attempt any TWO.</p> <ul style="list-style-type: none"> i) With respect to High carbon Steel, give the following <ul style="list-style-type: none"> a) % of carbon content b) Properties (Four) c) Uses (Four) ii) Give composition, properties and uses of <ul style="list-style-type: none"> a) Duralumin b) German Silver iii) Given four drawbacks of plain carbon steel. Give composition, two Properties and two uses of Heat treatable stainless steel. 	10
Q4	<p>Attempt any TWO.</p> <ul style="list-style-type: none"> i) State and derive Beer Lambert's law. ii) A 4.5×10^{-6} M solution of $K_2Cr_2O_7$ shows the transmittance of 0.44 in 2cm path length cell. Calculate <ul style="list-style-type: none"> a) Absorbance b) Molar extinction coefficient c) Absorbance if concentration is reduced to half and using 1cm path length cell. iii) Draw a neat labelled diagram of Double beam spectrophotometer. Give its working. 	10
Q5 (a)	<p>Attempt any THREE.</p> <ul style="list-style-type: none"> i) Explain, how P-doped and N-doped conducting polymers are synthesized. Give two applications of conducting polymers. ii) Give synthesis, properties and uses of Silicone rubber. iii) Explain and give two examples of each of the following w.r.t. compounding of plastics. <ul style="list-style-type: none"> a) Fillers b) Colouring matter c) Catalysts d) Plasticizers e) Lubricants iv) Elaborate on Use of polymers as biomaterials in medicines and surgery. 	15
Q5 (b)	<p>With respect to Fiber reinforced composites, give Fiber Phase, Matrix phase, Properties (Two points), Application (Two points) and limitation (Two points) of Aramid Fiber reinforced polymer composite</p>	5

15/5/18 (M)

SET B

K. J. Somaiya College of Engineering, Mumbai-77

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End Semester Exam

May - 2018

Max. Marks: 100

Class: F. Y. B. Tech

Name of the Course: Engineering Graphics

Course Code: USHC104

Duration: 3 Hrs.

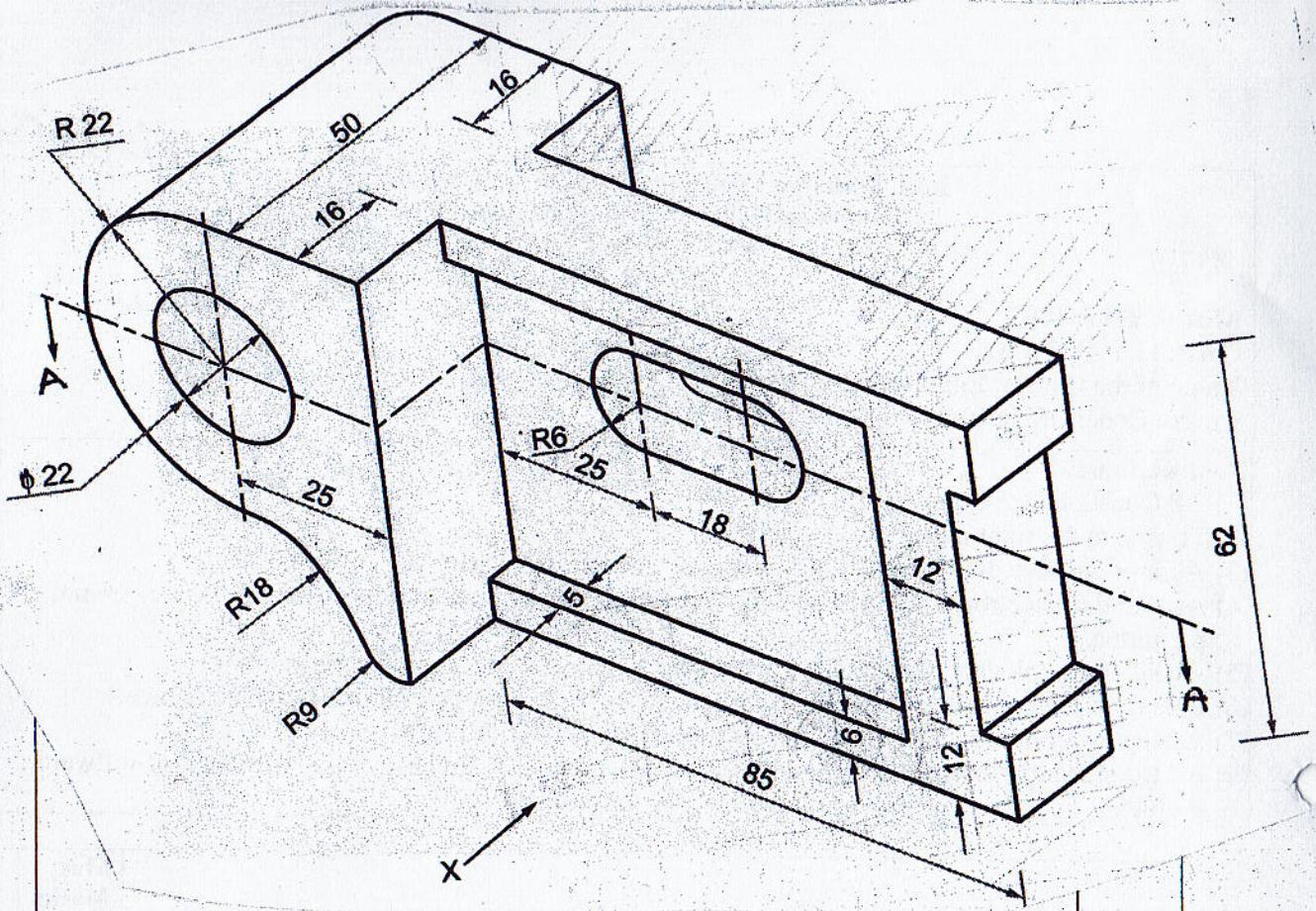
Semester: II

Branch: All

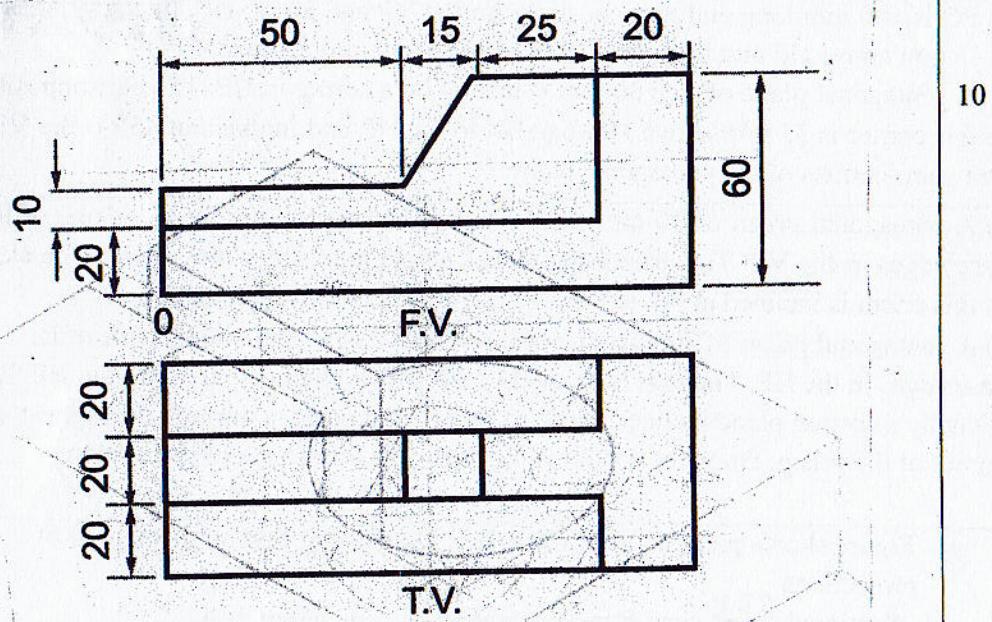
Instructions:

- (1) All Questions are Compulsory.
- (2) Figures to the right indicate full marks.
- (3) Assume suitable dimensions if necessary and state them clearly.
- (4) Any kind of electronic gadgets capable of memory storage such as pen drive, mobile etc. are not permitted.
- (5) Avoid using colours and layers in your drawings to avoid problems during printing.
- (6) Line type, Line thickness, title block, dimensions etc. at appropriate place have weightage.
- (7) Arrange your drawings properly and on minimum number of pages.
- (8) All the students are requested to save the drawings regularly. In case of any hardware or software problems, no extra time will be allotted to you for unsaved work.

Que. No.		Max Marks
Q1	Draw an involute of a circle of 60 mm diameter. Also draw a tangent and normal to the curve at any point by showing semi-circular construction.	10
Q2	a) PQ is 100 mm long and inclined at 45° to the VP and 30° to HP. Is mid point A is 35 mm above HP and 50 mm in front of VP. Draw projections of PQ. b) A pentagonal plane of side 30 mm is resting on a corner in HP. The side opposite to this corner is 35 mm above HP, parallel to the HP and inclined at 45° to the VP. Draw projections of the pentagonal plane.	10
Q3	a) A pentagonal prism of 30 mm side of base and axis 60 mm long has one of its base edges in the VP. This base edge makes an angle of 45° with the HP. The axis of this prism is inclined at 30° to the VP. Draw projections of the prism. b) A pentagonal prism of 30 mm side of base and axis 70 mm long has one of its base edges in the HP. The axis is parallel to the VP and inclined at 60° to the HP. It is cut by a section plane inclined at 60° to the HP and passing through the highest corner of the prism. Draw the sectional top view and true shape of the section.	15
Q4	a) Figure shows pictorial view of Object. Draw using first angle method of projections. i. Sectional Front ^{TOP} view from X direction, section along A-A ii. Front View; iii. Left Hand Side View. iv. Insert important dimensions	20



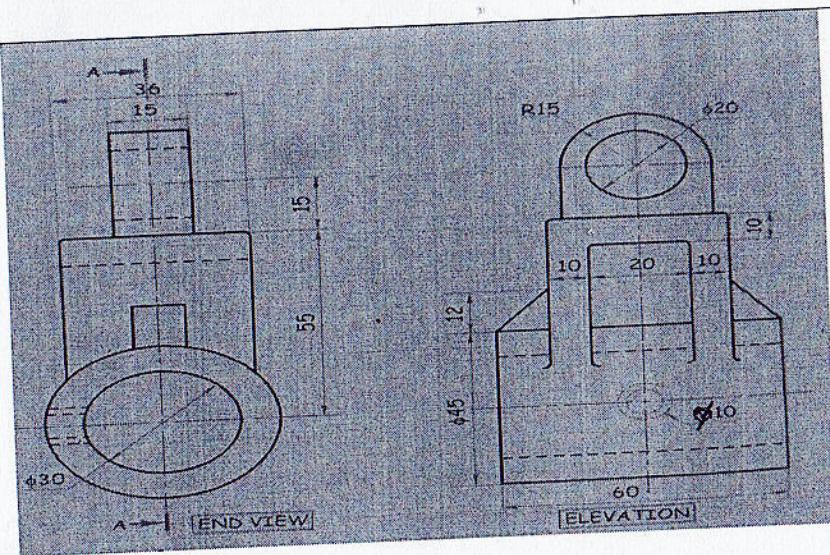
b) Figure shows the Front view and Top View of an object. Draw its isometric view with point 'O' as origin.



OR

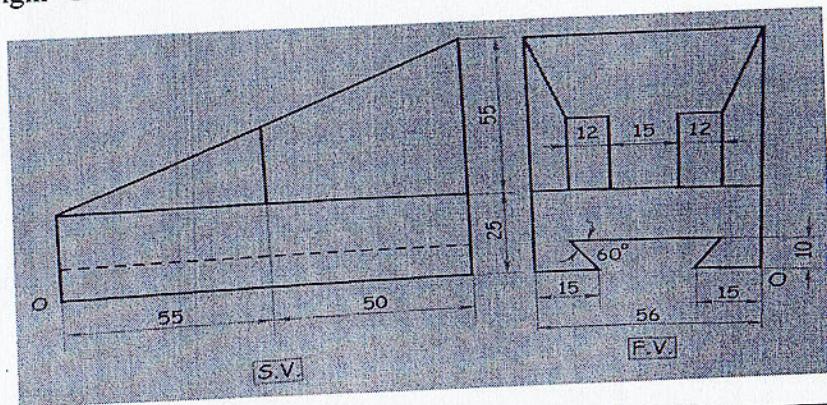
a) Figure shows F.V. and S.V. of an object. Draw, i) Sectional Front View along A-A, ii) Top View iii) RHSV. Use first angle method of projection.

20



b) Figure shows the Front view and RHSV of an object. Draw its isometric view about origin 'O'.

10



Q5 A pentagonal pyramid side of base 40 mm, axis height 75 mm has its base in the HP such that its one inclined edge is parallel to VP. A section plane perpendicular to the VP and inclined to the HP at 45° cuts the prism such that it bisects the axis. Major part of the edge which is parallel to the VP is retained. Draw the development of lateral surface of the retained portion of the pyramid.

10

OR

A square pyramid of 40 mm side of base and 70 mm axis height stands with its base in the HP. Its base sides are parallel to the VP. A section plane perpendicular to the VP and inclined at 60° to the HP cuts the pyramid such that it passes through a point on axis at 30 mm from apex. Draw the development of the surface of retained portion of pyramid if the apex is removed.

10

21-5-18(M)

**K. J. Somaiya College of Engineering, Mumbai-77
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**End Semester Examinations
May - June 2018**

Max. Marks: 100

Class:

Name of the Course: Basic Electrical and Electronics Engineering

Branch: ALL

Course Code: USHC/105

**Duration: 3 Hrs
Semester: I/II**

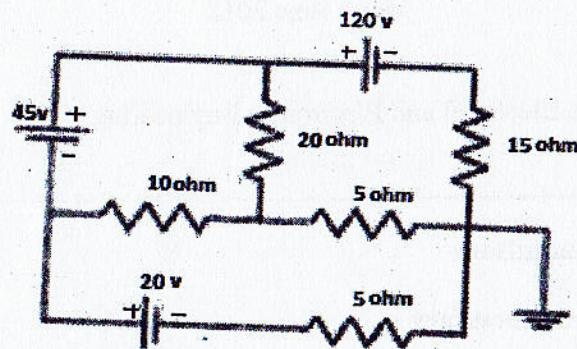
Instructions:

- (1) All Questions are Compulsory
- (2) Draw neat diagrams
- (3) Assume suitable data if necessary

Question No.		Marks
Q 1 (a)	<p>By mesh analysis find the current through 4 ohm resistor for the given circuit shown below</p>	10
	<p>OR</p> <p>Using source transformation find the current flowing through 10 ohm resistance</p>	10

Q 1 (b)

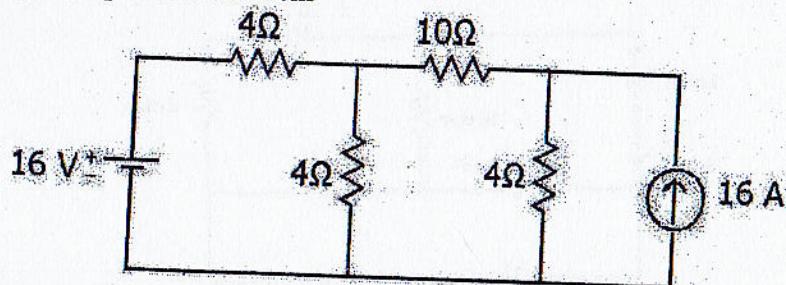
Obtain current through 15 ohm resistance by nodal analysis in fig shown below, take reference node as marked in the figure



10

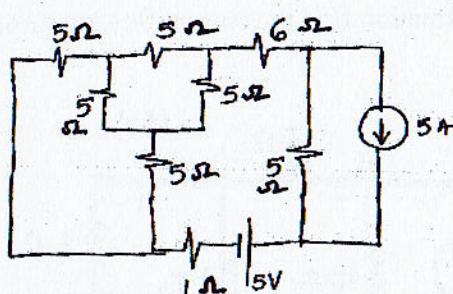
Q 2 (a)

Find the current through $10\ \Omega$ resistance in the given network by using superposition theorem



10

OR
Using source transformation find the current through 6 ohm resistor of the network shown below



10

Q2 (b)	<p>For the circuit shown, find value of resistance R_L for maximum power transfer and calculate maximum power.</p>	15
Q3 (a)	<p>Find rms value of the given waveform</p> <p>OR</p> <p>Find the rms value of the given waveform</p>	08
Q3 (b)	<p>A series RLC circuit, if ω_0 is the resonant frequency, ω_1 and ω_2 are the half power frequencies, prove that $\omega_0 = \sqrt{\omega_1\omega_2}$</p>	09
Q4 (a)	<p>Explain the construction and working of all types of 3 phase induction motor and explain its application in different fields.</p>	08
	<p>Explain with the help of double revolving field theory whether a single phase induction motor is self starting or not?</p>	08
Q4 (b)	<p>Derive the EMF equation of transformer. Also explain the losses in transformer in detail ?</p>	10

Q5 (a)	With the help of a neat circuit diagram and input output waveforms explain the working of the full wave centre tapped rectifier.	10
OR		
	Explain the construction and working of the following:-	
(i) Zener Diode (ii) LED		
		10
Q5 (b) With the help of a neat diagram, explain the input characteristics on an NPN transistor in common emitter configuration.		
		10

End Semester Exam
 May - June 2018

Max. Marks: 100

Class: FY BTech

Name of the Course: Engineering Mechanics

Course Code: USHC107

Duration: 3Hrs

Semester: II

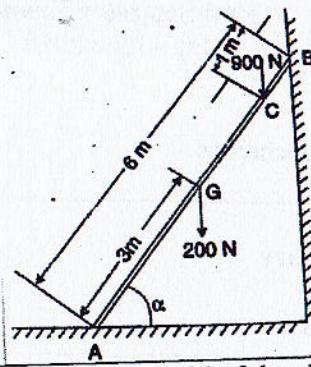
Branch: All

Instructions:

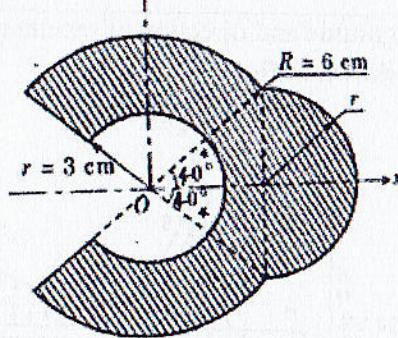
- (1) All Questions are Compulsory
- (2) Draw neat diagrams
- (3) Assume suitable data if necessary

Que. No.		Max. Marks
Q1 (a)	<p>Find the position, magnitude and direction of resultant R of only active forces on A-frame structure as shown in figure.</p>	10
Q1(b)	<p>Determine the force P required to start the wedge shown in figure. The angle of friction for all surfaces in contact is 15°.</p> <p>OR</p> <p>The ladder shown in figure is 6 m long and is supported by a horizontal floor and vertical wall. The coefficient of friction between wall and the ladder is 0.4 and that between floor and ladder is 0.25. The self-weight of ladder is 200 N and may be considered as concentrated at G. The ladder also supports a vertical load of 900 N at C which is at a distance of 1m from B. Determine the least value of α at</p>	10

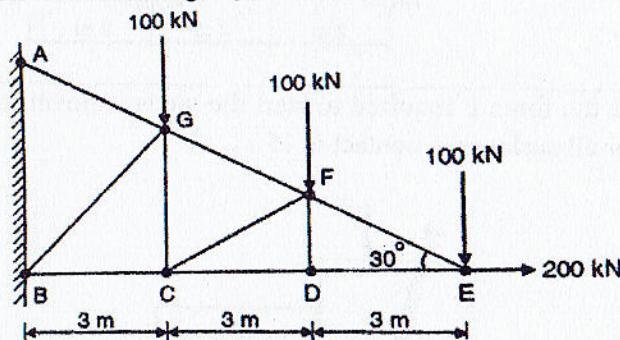
which the ladder may be placed without slipping. Determine reactions developed at that stage.



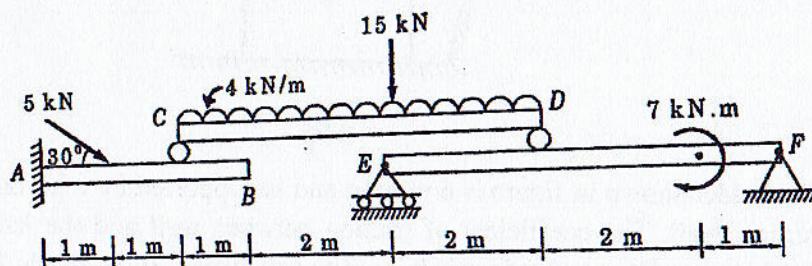
- Q2** Determine the coordinates of the centroid of the shaded area shown in figure (* 40°) 10

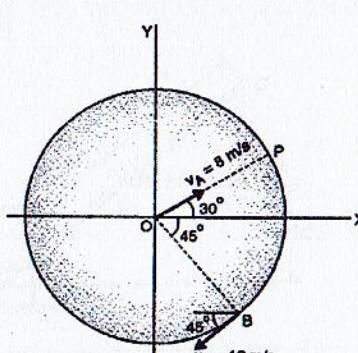
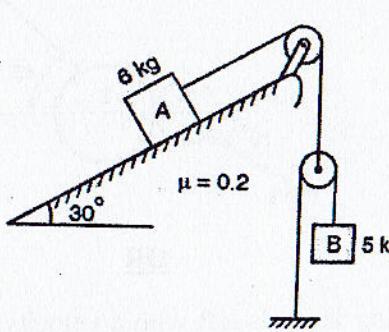


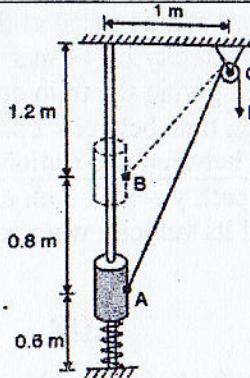
- Q3 (a)** Truss is loaded and supported as shown in figure.
Identify zero force members
Find forces in members meeting at joints C, D and E. 08



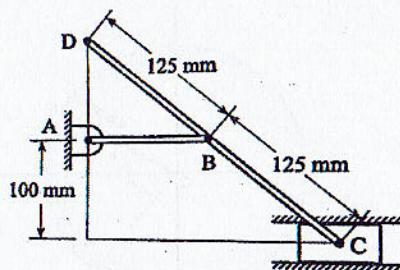
- Q3 (b)** Find the reactions at all the supports for a given compound beam. 12



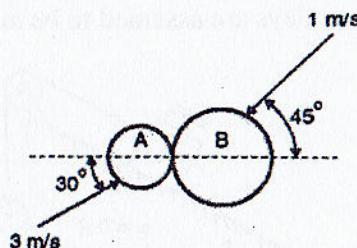
Q4 (a)	<p>A train leaves station A and attains speed at the rate of 4 m/s^2 for 6 seconds and then 6 m/s^2 till it reaches velocity of 48 m/s. Further velocity remains constant, and then brakes are applied giving the train constant deceleration stopping it in 6 seconds. If the total running time between 2 stations is 40 sec. Plot a-t, v-t and x-t curve. Determine distance between two stations.</p>	10
Q4 (b)	<p>A particle moves along a path $y = x^2/3$ with a constant speed of 8 m/s. What are the x and y components of its velocity when $x = 3\text{m}$. Find the acceleration at this point.</p> <p style="text-align: center;">OR</p> <p>A particle is moving along the line OP with uniform velocity of 8 m/s. Particle B is travelling along the 20 m radius circle with a uniform speed of 12 m/s. Determine the magnitude and direction of relative velocity and relative acceleration of A with respect to B at the instant shown.</p> 	10
Q5 (a)	<p>For the system shown in figure determine the acceleration of two blocks and the tension in strings. The pulleys are assumed to be massless and frictionless.</p>  <p style="text-align: center;">OR</p> <p>A collar with mass 6 kg is attached to a spring with modulus 800 N/m. The free length of spring is 0.6 m and it is initially undeformed. A force F applied on the inextensible cord causes the collar to slide upwards. The collar starts from rest from point A and reaches a velocity of 2 m/s when it reaches point B. Neglecting friction determine force F.</p>	10



- Q5 (b) At the position shown in figure, the crank AB has angular velocity of 3 rad/sec clockwise. Find the velocity of slider C and point D at the instant shown.
 $AB = 100 \text{ mm}$

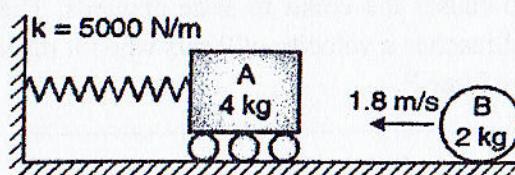


- Q5 (c) Two smooth balls collide as shown in figure. If $m_A = 1 \text{ Kg}$, $m_B = 2 \text{ Kg}$ and $e = 0.75$, find the velocities of both the balls after impact.



OR

A 2 Kg sphere slipping towards left with a velocity of 1.8 m/s strikes stationary vertical face of 4 Kg block A which is mounted on rollers on horizontal plane. The other vertical face of block is attached to a horizontal spring of constant 5000 N/m as shown. If coefficient of restitution for block and sphere material is 0.75, determine maximum compression of spring due to impact. Neglect friction.



End Semester Examinations
 April - May 2018

Max. Marks: 100

Class: FY

Name of the Course: Fundamentals of Computer Programming (FCP)
 Course Code: USHC108

Duration: 3 Hours
 Semester: II
 Branch: All

Instructions:

- (1) All Questions are Compulsory
- (2) Draw neat diagrams
- (3) Assume suitable data if necessary

Question No.		Marks
Q 1	<p>Given the Problem Statement "To generate the generate the timetable of a school".</p> <p>Write a Problem definition with the detail analysis of a given problem statement to remove ambiguities, inconsistencies and incompleteness, if any.</p>	10
Q 2 (a)	<p>Write the output of the following program with explanation.</p> <pre>#include <stdio.h> main() { int ch = 'a' + 'b'; switch (ch) { case 'a': case 'b':printf("\nYou entered b"); case 'A':printf("\na as in ashar"); case 'b' + 'a':printf("\nYou entered a and b"); } }</pre>	5
Q2 (b)	<p>Write the output of the following program with explanation.</p> <pre>struct gospel { int num ; char mess1[50] ; char mess2[50] ; } m1 = { 2, "Good Morning", "Have a nice day" } ; main() { struct gospel m2, m3 ; m2 = m1 ; m3 = m2 ; printf ("n%d %s %s", m1.num, m2.mess1, m3.mess2) ;</pre>	5

Q2(c)	<p>Write the output of the following program with explanation.</p> <pre>#include <stdio.h> int main() { int i, j; for(i=1;i<=5;i++) { for(j=i;j>=1;j--) { printf("%c",'A' + j-1); } printf("\n"); } return 0; }</pre>	5
Q2 (d)	<p>Write the output of the following program with explanation.</p> <pre>#include<stdio.h> main() { int i = 1, j = 1 ; for (; ;) { if (i > 5) break ; else j += i ; printf("\n%d", j) ; i += j ; } }</pre>	5
Q3 (a)	<p>Write a program to add first seven terms of the following series using a for loop:</p> $1/1! + 2/2! + 3/3! + \dots$	10
Q3 (b)	<p>With respect to Operators, Explain the working, associativity of following terms with examples for each:</p> <ol style="list-style-type: none"> Comma Operator Conditional Operators 	10
Q3 (c)	<p>Write a program to print the following pattern :</p> <pre> * ** *** **** ***** ***** ***** ***** ***** </pre>	10

Q4 (a)	<p>Differentiate between Structures and Unions with examples and Corresponding Outputs for each.</p> <p style="text-align: center;">OR</p> <p>A record contains name of cricketer, his age, number of test matches that he has played and the average runs that he has scored in each test match. Create an array of structures to hold records of 20 such cricketer and then write a program to read these records and arrange them in ascending order by average runs.</p>	10
Q4 (b)	<p>For the following set of sample data, compute the standard deviation and the mean:</p> <p>-6, -12, 8, 13, 11, 6, 7, 2, -6, -9, -10, 11, 10, 9, 2</p> <p>The formula for standard deviation is</p> $\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \mu)^2}$ <p>where μ=Mean, N=number of terms, x_i are the individual data.</p> <p style="text-align: center;">OR</p> <p>Write a program that replaces two or more consecutive blanks in a string by a single blank. For example, if the input is- Grim return to the planet of apes!! The output should be- Grim return to the planet of apes!!</p>	10
Q5 (a)	<p>Compare the following File opening Modes: r, a, r+, a+, Also explain the working of fscanf function.</p> <p style="text-align: center;">OR</p> <p>Write a program to that prints file contents in reverse order.</p>	10
Q5 (b)	<p>Write a function to convert a decimal number to Octal number . The function receives the decimal number from main() and returns the Octal number which is printed through main().</p>	10
	<p style="text-align: center;">OR</p> <p>Write a program to find the Sum of Digits of a Number using Recursion</p>	