14MA101

Hall Ticket Number:

I/IV B. Tech (Supplementary) DEGREE EXAMINATION

May, 2018 **Common to all branches**

First Semester **Engineering Mathematics - I**

Time: Three Hours **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)

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   a) Define Rank of a matrix.
   b) Is the set of vectors (1,0,-1),(0,1,-1),(1,-1,0) linearly independent? Justify.
   c) Write any two properties of Eigen Values.
   d) Find the Stationary Points of $f(x,y) = x^2+y^2+6x+12$.
   e) Define Hermitian matrix and give an example.
   f) Write Maclaurin's series for function of one variable.
   g) Define Periodic function.
   h) Find the constant term in the Fourier series of $f(x) = x$, $-\pi < x < \pi$.
   i) Give an example of a function which is neither even nor odd.
   j) Change $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)} dx\, dy$ to polar form.
   k) Find the area of the finite region between the cures y = x and $y = \sqrt{x}$.
   l) Evaluate $\int_0^4 \int_0^{x^2} e^{\frac{y}{x}} dy\, dx$.

UNIT I

2.a Investigate for what values of λ *and* μ *the* simultaneous equations
$2x + 3y + 5z = 9$; $7x + 3y - 2z = 8$; $2x + 3y + \lambda z = \mu$
have (i) No Solution (ii) a unique solution (iii) an infinite number of solutions . 6M

2.b Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$. 6M

(OR)

3.a Find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ by Gauss – Jordan method. 6M

3.b Are the Vectors $X_1 = (1,3,4,2), X_2 = (3,-5,2,2)$ and $X_3 = (2,-1,3,2)$ linearly dependent? If so find the relation among them. 6M

UNIT II

4.a If $f(x) = \sin^{-1} x,\ 0 < a < b < 1$ use mean value theorem to prove that

$$\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b-a}{\sqrt{1-b^2}}$$ 6M

4.b Diagnolize the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$. 6M

(OR)

5.a Verify Role's theorem for $f(x) = (x+2)^3 (x-3)^4$ in $(-2,3)$. 6M

5.b Discuss the maxima and minima of $f(x,y) = x^3 y^2 (1-x-y)$. 6M

UNIT III

6.a Find the Fourier Series to represent the function $f(x) = \cos x$, $-\pi \le x \le \pi$. 6M

6.b Express f (x) = x as a half – range cosine series in $0 < x < 2$. 6M

(OR)

7.a If $f(x) = 2x - x^2$ in $0 \le x \le 2$, show that f(x) = $\frac{2}{3} - \sum_{n=1}^{\infty} \frac{4}{n^2\pi^2} Cosn\pi x$. 6M

7.b Find the complex form of the fourier series for the function f (x) = cos ax, $-\pi < x < \pi$. 6M

UNIT IV

8.a Change the order of integration and evaluate $\int_0^{\infty}\int_x^{\infty} \frac{e^{-y}}{y} dydx$. 6M

8.b Evaluate $\iint xy\, dxdy$ over the positive Quadrant of the circle $x^2+y^2= a^2$. 6M

(OR)

9.a Find the area of a plate in the form of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. 6M

9.b Find the volume of the tetrahedron x = 0 , y = 0, z = 0 and the plane $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$. 6M

MA01(111)

Hall Ticket Number:

I/IV B.Tech (Supplementary) DEGREE EXAMINATION

May, 2018 **Common to all branches**

First Semester **Mathematics - I**

Time: Three Hours **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)

a) Define minor of a matrix.

b) Define a Hermitian matrix.

c) Give an example of a 3X 3 Skew Symmetric matrix.

d) Write Rolle's theorem.

e) Define linear independent vectors.

f) Define Saddle point.

g) Find the integrating factor of $\cos^2 x \frac{dy}{dx} + y = \tan x$.

h) Write general form of Bernoulli's equation.

i) Define Orthogonal trajectories.

j) Solve $\frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 9x = 0$.

k) Find the particular integral of $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 3x = \sin t$.

l) State Euler – Cauchy equation.

UNIT I

2.a Using the Gauss – Jordan method , find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$ 6M

2.b Define the Rank of a matrix and find the rank of the matrix $\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 3 \\ 1 & 3 & 4 & 1 \end{bmatrix}$ 6M

(OR)

3.a Solve the equations x + y + z = 4, x – y +z = 0, 2x +y + z = 5. 4M

3.b Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ 8M

UNIT II

4.a Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to principal axes and also write matrix of transformation. 6M

4.b If $f(x) = \sin^{-1} x$, $0 < a < b < 1$, use mean value theorem to prove that $\frac{b-a}{\sqrt{1-a^2}} < \sin^{-1} b - \sin^{-1} a < \frac{b-a}{\sqrt{1-b^2}}$ 6M

(OR)

5.a Using Maclaurin's series expand the function $\ln(1+x)$ hence deduce that $\ln\sqrt{\frac{1+x}{1-x}} = x + \frac{x^3}{3} + \frac{x^5}{5} +$ ---------- 6M

5.b Find the maximum and minimum distance of the point (3,4,12) from the sphere $x^2 + y^2 + z^2 = 1$. 6M

UNIT III

6.a Solve $(x^3y^2 + xy)\,dx = dy$ 6M

6.b A body originally at 80^0 C cools down to 60^0 C in 20 minutes, the temperature of the air being 40^0 C .What will be temperature of the body after 40 minutes from the original? 6M

(OR)

7.a Find the orthogonal trajectories of the family of parabolas $y^2 = 4ax$. 6M

7.b Solve $\left(1+x^2\right)y'+3xy-6x=0$. 6M

UNIT IV

8.a Solve the initial value problem $y''+y'-2y=0,\ \ y(0)=4, y'(0)=1$. 6M

8.b Find a real general solution of $x^2y''-xy'+y=0$. 6M

(OR)

9.a Solve the non homogenous differential equation $(D^2 - 1)y = e^x \cos x$ by the method of variation of parameters.. 6M

9.b Solve $(D^2 - 3D + 2)\ y = x^2$ by the method of undetermined Coefficients. 6M

14PH102/PH112

Hall Ticket Number:

I/IV B.Tech (Supplementary) DEGREE EXAMINATION

May, 2018 **Common to all Branches**

First Semester **Engineering Physics-I**

Time: Three Hours **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)
   a) Why Newton's rings are circular in shape?
   b) Define diffraction.
   c) What is Kerr effect?
   d) What is the ratio of He-Ne, in He-Ne laser?
   e) What is the principle involved in Holography?
   f) Define Acceptance angle of an optical fiber.
   g) State Gauss law in magnetism.
   h) Define quality factor.
   i) What is the velocity of electromagnetic waves?
   j) Are matter waves associated with earth? Explain.
   k) State Heisenberg's Uncertainty principle.
   l) What is normalised wave function?

UNIT I

2. a) Explain the interference of light due to thin films. 6M
   b) What are the necessary conditions for obtaining interference fringes? 3M
   c) A parallel beam of light $\lambda=5890A^0$, is incident on a glass plate ($\mu=1.5$) such that angle of refraction into the plate is 60^0. Calculate the smallest thickness of the plate which will make it appear dark by reflection. 3M

(OR)

3. a) Explain with theory how wavelength of spectral line is determined using plane diffraction grating? 6M
   b) Explain the construction and working of Nicol prism. 6M

UNIT II

4. a) Explain the construction and working of a Ruby laser with suitable diagram. 6M
   b) Write a note on types of optical fibers. 6M

(OR)

5. a) What is numerical aperture of an optical fiber? Derive the expression for it. 6M
   b) Explain about the recording and reproduction of holography. 6M

UNIT III

6. a) Describe the construction and working of Cyclotron. 6M
   b) Write Maxwell's equations in integral form and in differential form. 6M

(OR)

7. a) State Hall effect. Derive the expression for hall coefficient. 6M
   b) Discuss the phenomenon of resonance in a LCR series a.c circuit. 6M

UNIT IV

8. a) What is de-Broglie's hypothesis? Give an experimental support for it. 6M
   b) Derive one dimensional Schrodinger's time-independent wave equation. 6M

(OR)

9. a) Using Heisenberg's uncertainty principle show that electrons are not exist inside the nucleus. 6M
   b) Write a short note on scanning tunnelling microscope. 6M

14CY103(Y16)

Hall Ticket Number:

I/IV B.Tech. (Supplementary)DEGREE EXAMINATION

May, 2018 **Common to all Branches**

First Semester **Engineering Chemistry-I**

Time: Three Hours **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)
   a) Which of the following salts do not cause hardness?
   i) $CaSO_4$ ii) $Ca(HCO_3)_2$ iii) $Mg(HCO_3)_2$ iv) Na_2SO_4 v) K_2CO_3 vi) LiOH
   b) Mention different types of alkalinity.
   c) Write the principle of ion exchange process of softening.
   d) Which type of impurities are removed by sedimentation?
   e) What is the function of semipermeable membrane in reverse osmosis?
   f) How many components are present in aqueous solution of NaCl?
   g) Differentiate between HCV and LCV.
   h) How do you calculate oxygen of a coal sample in ultimate analysis?
   i) Name the process used to separate various fraction present in petroleum.
   j) Give an example of good refractory material.
   k) Write any two applications of layered composite materials.
   l) What is viscosity?

UNIT I

2. a) How do you determine hardness of a water sample using EDTA method? 6M
   b) Calculate the amount of lime required for softening 50,000 litres of hard water containing $CaCO_3$=25 ppm, $MgCO_3$=144 ppm, $CaCl_2$=111 ppm, $MgCl_2$=95 ppm, Na_2SO_4=15 ppm and Fe_2O_3=25 ppm (Treat hardness by carbonates as temporary hardness). 6M

(OR)

3. a) Explain any three reasons for corrosion of boiler material. How do you minimize corrosion of boiler? 6M
   b) How do you minimize formation of scales in boilers by the following conditioning methods? (i) Calgon conditioning (ii) Carbonate conditioning 6M

UNIT II

4. a) Define coagulation. Give examples of coagulants. Explain the mechanism of coagulation with necessary equations. 6M
   b) Explain the determination of break point using graph. Write the significance of break point chlorination. 6M

(OR)

5. a) How do you construct the phase diagram of Bi-Cd system by thermal analysis? Explain. 6M
   b) Draw the phase diagram of lead-silver system and explain it using phase rule equation. 6M

UNIT III

6. a) How can you determine calorific value of a given fuel using Bomb calorimeter? 6M
   b) Explain the proximate analysis of a coal sample. Write the significance of each component. 6M

(OR)

7. a) Explain synthesis of petrol by Bergius process. 6M
   b) Write a note on the following: (i) Knocking (ii) Cracking (iii) CNG 6M

UNIT IV

8. a) Write the preparation, properties and applications of the following refractories:
   (i) Magnesite bricks (ii) Zirconia bricks 6M
   b) Explain about the following properties of refractories:
   (i) Refractoriness under load (ii) Thermal spalling 6M

(OR)

9. a) Explain about any mechanism of lubrication. 6M
   b) Write a note on i) Flash and fire points ii) Cloud and pour points iii) Viscosity index 6M

CY01 (113)

Hall Ticket Number:

I/IV B.Tech (Supplementary) DEGREE EXAMINATION

May, 2018 **Common to all Branches**

First Semester **Engineering Chemistry-I**

Time: Three Hours **Maximum :** 60 Marks

Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

1. Answer all questions (1X12=12 Marks)
   a) What are the chemical compounds responsible for alkalinity?
   b) Distinguish soft water and demineralised water.
   c) Define priming and foaming.
   d) Explain degree of polymerisation.
   e) Mention the monomers used in preparation of polyurethane.
   f) Differentiate physical and chemical adsorption.
   g) What are advantages of lithium batteries over conventional batteries?
   h) Define calorific value of a fuel.
   i) What is Gross calorific value?
   j) Name the constituents of composite materials. Give examples.
   k) Explain the role of porosity in refractory functioning.
   l) Name the property which makes graphite useful as a good lubricant.

UNIT I

2. a) Explain determination of hardness of water by EDTA method. 8M
   b) 100 ml of water sample requires 20ml 0.1 M EDTA solution using Erio Chrome Black-T indicator. Calculate the hardness of water sample. 4M

(OR)

3. a) Write a note on internal conditioning of water. 4M
   b) Describe demineralisation process. Compare the same with lime soda method. 8M

UNIT II

4 a) Derive Freundlisch's adsorption isotherm. Discuss various factors which effect adsorption of gas on solids. 8M
   b) Write about the role of Adsorbents in catalysis. 4M

(OR)

5. a) Explain vulcanisation of natural rubber and its advantages. 6M
   b) Write the preparation, properties and uses of Teflon and polyvinyl chloride. 6M

UNIT III

6. a) Describe the determination of calorific value of solid fuel using bomb calorimeter. 6M
   b) Discuss ultimate analysis of coal and its significance. 6M

(OR)

7. a) Describe the construction of lead acid battery with reactions occurring during discharge. 6M
   b) Write notes on solar cells and their applictions. 6M

UNIT IV

8. a) What are the functions of lubricants? Explain viscosity index, flash and fire points and their significance. 8M
   b) Write the applications of polymer matrix composites. 4M

(OR)

9. a) Discuss about natural abrasives. 6M
   b) Write notes on i) Refractoriness ii) Thermal spalling iii) Silicon carbide 6M

CE/CS/EC/IT 115 & BT/CH/EE/EI 125

Hall Ticket Number:

I/IV B.Tech (Supplementary)DEGREE EXAMINATION

May , 2018 — **Common to All Branches**

First Semester — **Engineering Mechanics**

Time: Three Hours — **Maximum :** 60 Marks

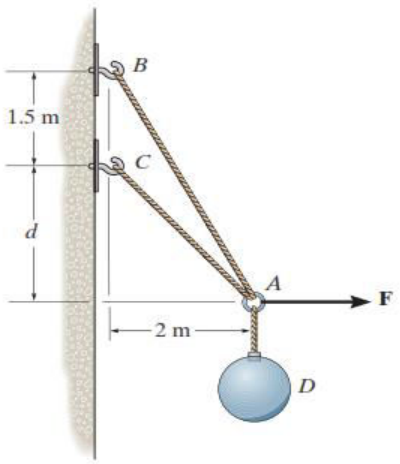
Answer Question No.1 compulsorily. (1X12 = 12 Marks)

Answer ONE question from each unit. (4X12=48 Marks)

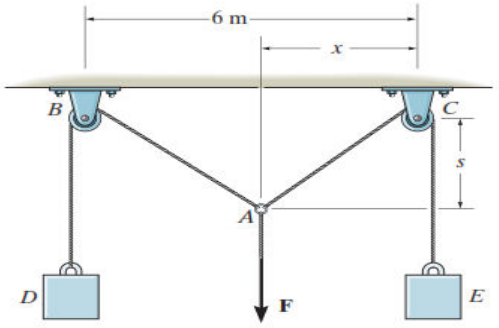
1. Answer all questions (1X12=12 Marks)
   a) State the conditions for equilibrium of a particle.
   b) What do you mean by resultant of a system of forces?
   c) State Varignon's theorem of moments.
   d) List the characteristics of dry friction
   e) Differentiate the centre of gravity from centroid
   f) What do you mean by radius of gyration of an area?
   g) If the distance travelled by a particle is given by s = $(2t^3)$ m, where t is in seconds, determine the particle's velocity when $t = 2$ *s*.
   h) In a children park, a train is moving in a circular path. If the linear and angular speeds of the train are 10 m/s and 0.25 rad/s respectively, find the radius of the circular path.
   i) Determine the force, which can move a body of mass *100 kg* with an acceleration of $3.5\ m/s^2$
   j) A motor boat is moving with a steady speed of *10 m/s*. if the water resistance to the motion of the boat is *600 N*, determine the power of the boat engine.
   k) A truck of mass 15 tonnes travelling at 1.6 m/s impacts with a buffer spring, which compresses 1.25 mm per kN. Find the maximum compression of the spring.
   l) State the principle of linear impulse and momentum.

UNIT I

2. a) Determine the forces in cables AC and AB needed to hold the 20-kg ball D in equilibrium. Take F = 300 N and d= 1 m. 4M

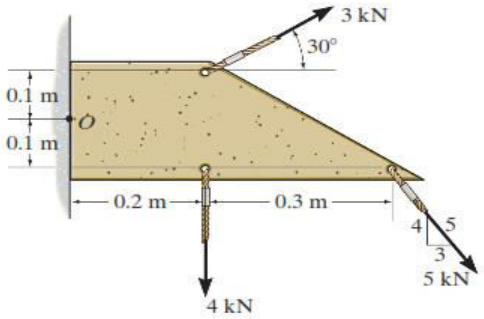


   b) Blocks D and E have a mass of 4 kg and 6 kg respectively. If F = 80 N, determine the sag ***s*** and distance ***x*** for equilibrium. 8M

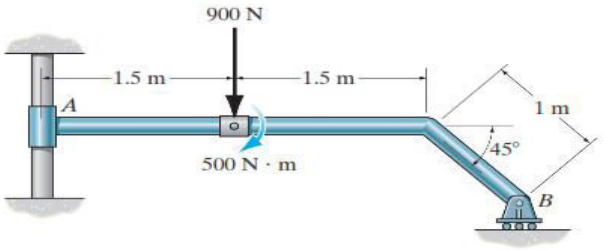


(OR)

3. a) Replace the force and couple system shown in Fig. by an equivalent resultant force and couple moment acting at point O. 6M

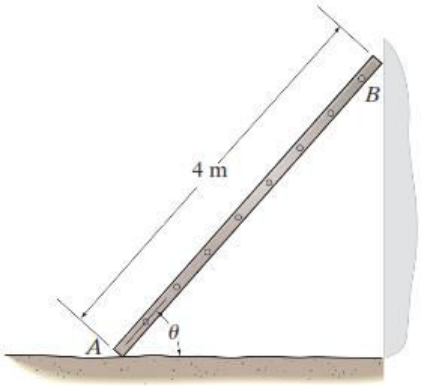


b) Determine the support reactions on the member in Fig. The collar at A is fixed to the member and can slide vertically along the vertical shaft. 6M

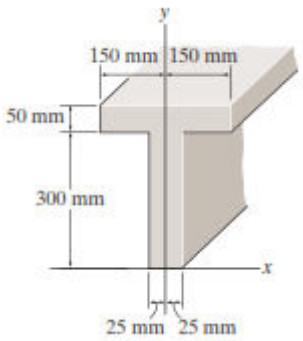


UNIT II

4. c The uniform 10-kg ladder in Fig. rests against the smooth wall at B, and the end A rests on the rough horizontal plane for which the coefficient of static friction is 0.3. Determine the angle of inclination θ of the ladder and the normal reaction at B if the ladder is on the verge of slipping. 6M

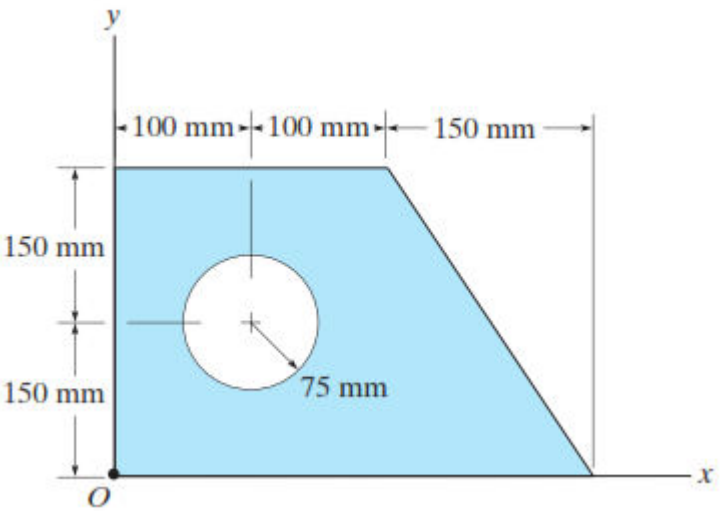


b) Locate the centroid of the beam's cross-sectional area shown in fig. 6M



(OR)

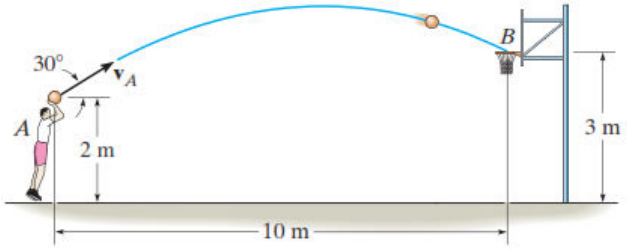
5. Determine the moment of inertia of the shaded area about x and y axes. 12M



UNIT III

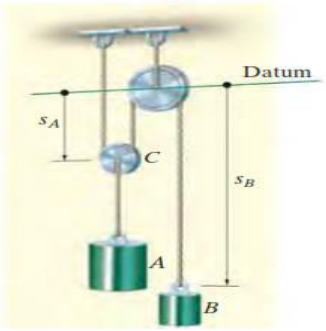
6. a) During a test a rocket travels upward at 75 m/s, and when it is 40 m from the ground its engine fails. Determine the maximum height reached by the rocket and its speed just before it hits the ground. While in motion the rocket is subjected to a constant downward acceleration of 9.81 m/s^2 due to gravity. Neglect the effect of air resistance. 6M

b) Neglecting the size of the ball, determine the magnitude v_A of the basketball's initial velocity and its velocity when it passes through the basket. 6M

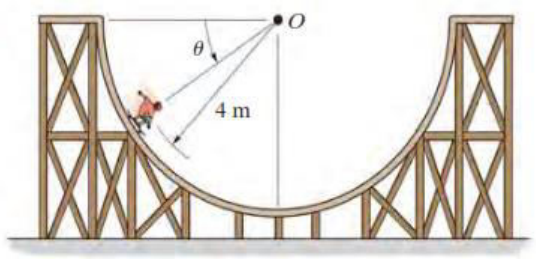


(OR)

7. a) The 100-kg block A shown in Fig.is released from rest. If the masses of the pulleys and the cord are neglected, determine the velocity of the 20-kg block B in 2 s. 6M

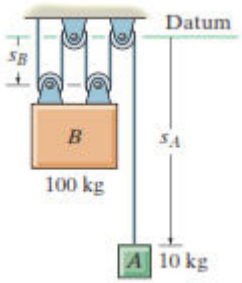


b) The 60-kg skateboarder in Fig. coasts down the circular track. If he starts from rest when Θ= 0°, determine the magnitude of the normal reaction the track exerts on him when Θ=60°. Neglect his size for the calculation. 6M

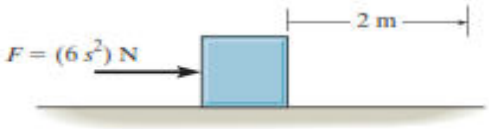


UNIT IV

8. a) Blocks A and B shown in Fig. have a mass of 10 kg and 100 kg, respectively. Determine the distance B travels when it is released from rest to the point where its speed becomes 2 m/s. 8M

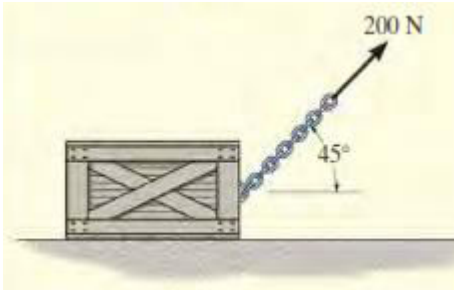


b) Determine the work of the force when it displaces 2 m. 4M

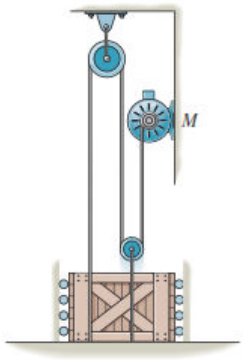


(OR)

9. a) The 100-kg crate shown in Fig. is originally at rest on the smooth horizontal surface. If a towing force of 200 N, acting at an angle of 45°, is applied for 10 s, determine the final velocity and the normal force which the surface exerts on the crate during this time interval. 6M



b) The motor, M, pulls on the cable with a force $F = (10t^2 + 300)$ N, where t is in seconds. If the 100 kg crate is originally at rest at $t = 0$, determine its speed when $t = 4$ s. Neglect the mass of the cable and pulleys



6M

Scheme of evaluation

1	For all questions - each 1M		(1X12=12 Marks)
	UNIT I		
2	a)	Equilibrium equations – 2M Determination of forces in the cables- 2M	4M
	b)	FBD of point A and Equilibrium eqns – 3M Determination of orientation of tensions in the cable at A- 3M Determination of s and x – 3M.	8M
3	a)	Determination of resultant force magnitude and direction – 4M Determination of couple moment acting at point O.- 2M	6M
	b)	FBD- 2M Equilibrium eqns – 2m Determination of the support reactions – 2M	6M
4	a)	FBD- 2M Equilibrium eqns – 2m Determination of Θ – 2M	6M
	b)	Determination of x_i's and y_i;s – 2M Determination of A_i's– 1M Determination of coordinates of centroid – 3M	6M
5		Division of composite area into regular areas – 2M Determination of moment of inertia of each area about x-axis-3M Determination of moment of inertia of each area about y-axis-3M Determination of moment of inertia of section about x-axis-2M Determination of moment of inertia of section about y-axis-2M	12M
6	a)	Determination of Max. Height – 3M Determination of velocity – 3M.	6M
	b)	Defining the coordinate system -1M Equations of Horizontal motion-1M Equations of vertical motion-1M Determination of V_A-2M Determination of V_B-1M	6M
7	a)	FBD- 2M Equations of motion – 2M Kinematics to determine the velocity of block B-2M	6M
	b)	FBD- 2M Equations of motion – 2M Kinematics to determine the normal reaction-2M	6M
8	a)	FBD of Blocks A and B - 3M Application of principle of work and energy to find the velocity- 3M Determination of distance travelled by block B-2M	8M
	b)	expression for work done- 2M Magnitude of work done – 2M	4M
9	a)	FBD- 2M Application of principle of impulse and momentum to find the velocity – 2M Application of principle of impulse and momentum to find the normal force-2M	6M
	b)	FBD-3M Determination of time needed to began lifting of crate – 1M Use of principle of impulse and momentum to find the velocity-2M	6M

BT/CE/CH/EE 116
CS/EC/IT/ME 126

Hall Ticket Number:

I/IV B.Tech (Supplementary) DEGREE EXAMINATION

May, 2018 — **Common to All Branches**

First/Second Semester — **Engineering Graphics**

Time: Three Hours — **Maximum :** 60 Marks

Answer ONE question from each unit. (5X12=60 Marks)

UNIT I

1. Draw a straight line AB of any length. Mark a point F, 65 mm from AB. Trace the path of a point P moving in such a way, that the ratio of its distance from the point F, to its distance from AB is 1. Plot at least eight points. And also draw normal and tangent at any point on the curve.

(OR)

2. A circle of40 mm diameter rolls along a straight line without slipping. Draw the curve traced by a point on the circumference, for one complete revolution of the circle. Name the curve. Draw a normal and tangent to the curve at a point 25 mm from the straight line.

UNIT II

3. A 70 mm long line PQ is inclined at 30^0 to the HP. The end P is 15mm in front of the V.P. and 25 mm above the H.P. The front view of the line measures 45 mm. Draw the Projections of the line PQ and determine its true angle of inclination with the V.P.

(OR)

4. The distance between the projectors of a straight line AB is 60 mm. One end A is 10 mm above the H.P and 20 mm in front of the V.P. while the other end B is 40 mm below the H.P and 50 mm behind the V.P. Draw its projections and mark its traces. Also find its true length and true inclinations with both the reference planes.

UNIT III

5. Draw the projections of a regular pentagon of 40 mm side, having its surface inclined at 30^0 to the H.P. and a side parallel to the H.P. and inclined at an angle of 60^0 to the V.P.

(OR)

6. A regular hexagon of 40 mm side has a corner in the HP. Its surface is inclined at 45° to the HP and the top view of the diagonal through the corner which is in the HP is making an angle of 60° with the VP. Draw its projections.

UNIT IV

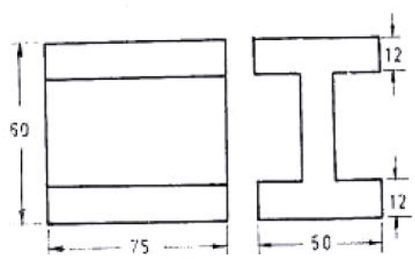
7. A pentagonal prism is resting on a corner of its base on the ground with a longer edge containing that corner inclined at 45^0 to the H.P. and the vertical plane containing that edge and the axis inclined at 30^0 to the V.P. Draw its projections. Base 40mm side; height 65mm.

(OR)

8. A square pyramid of base side 40 mm and axis 80 mm long is freely suspended from one of the corners of its base and its axis as a vertical plane is making an angle of 45^0 to the V.P. Draw its projections.

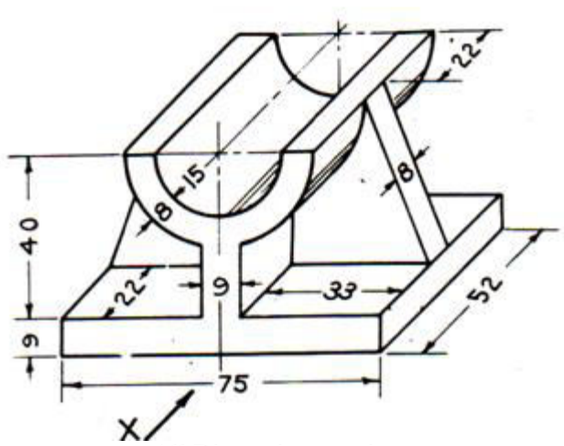
UNIT V

9. Draw the isometric view of the object whose orthographic projections are given in figure. All dimensions are in mm.



(OR)

10. Draw the front view, top view and side view of the block shown below.



All Dimensions are in mm