Register Number :

Name of the Candidate :

0 1 1 3

B.E. DEGREE EXAMINATION, 2016

(ANNUAL PATTERN)

(FIRST YEAR)

CLEC-102. ENGINEERING MATHEMATICS - I

(Common To ALL Branches)

May] [Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.

UNIT – I

1. (a) Diagonalise the matrix $A = \begin{pmatrix} 2 & 1 & -1 \\ 1 & 1 & -2 \\ -1 & -2 & 1 \end{pmatrix}$ by means of an orthogonal transformation. (8)

(b) Find the evolute of the parabola $x^2 = 4ay$. (7)

(OR)

2. (a) Find the eigen values and the eigen vectors of the matrix $A = \begin{pmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{pmatrix}$. (7)

(b) Find the circle of curvature of $\sqrt{x} + \sqrt{y} = \sqrt{a}$ at $\left(\frac{a}{4}, \frac{a}{4}\right)$. (8)

UNIT - II

3. (a) Solve : $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = x^2 + 4\sin x$. (8)

(b) The differential equation satisfying a beam uniformly loaded (w kg/ metre) with one end fixed and the second end subjected to tensile force p is given by

$$EI\frac{d^2y}{dx^2} - py = -\frac{1}{2}wx^2.$$

Find the elastic curve for the beam with conditions $y = \frac{dy}{dx} = 0$ at $x = 0$. (7)

(OR)

4. (a) Solve : $\frac{dx}{dt} + y = \sin t$; $\frac{dy}{dt} + x = \cos t$ given that $t = 0$, $x = 1$, $y = 0$. (8)

(b) Solve : $\left(x^3 D^3 + 9x^2 D^2 + 18xD + 6\right) y = \frac{1}{x}$. (7)

UNIT - III

5. (a) Change the order of integration and hence, find the value of $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} xy \, dy \, dx$. (8)

(b) Show that $\bar{A} = yz\bar{i} + xz\bar{j} + xy\bar{k}$ is irrotational and hence, find its scalar potential. (7)

(OR)

6. (a) Evaluate : $\int_0^1 \int_0^x \int_0^{\sqrt{x+y}} z \, dz dy dx$. (5)

(b) Verify Stoke's theorem for a vector field $\bar{A} = \left(x^2 + y^2\right)\bar{i} + 2xy\,\bar{j}$ in the rectangular region of the $z = 0$ plane bounded by the lines $x = 0$, $x = a$, $y = 0$ and $y = b$. (10)

UNIT - IV

7. (a) If $f(z) = u + iv$ is analytic, find $f(z)$ given that $u + v = \frac{\sin 2x}{\cosh 2y - \cos 2x}$. (8)

(b) Evaluate : $\int_0^{2\pi} \frac{d\theta}{13 + 5\sin\theta}$ using contour integration. (7)

(OR)

8. (a) Find Laurent's expression of $f(z) = \frac{7z - 2}{z(z-2)(z+1)}$ in $1 < |z + 1| < 3$. (8)

(b) Find the image of $|z - 2i| = 2$. under the mapping $w = \frac{1}{z}$. (7)

UNIT - V

9. (a) Find the Laplace transform of $t^2e^{-t}\cos t$. (8)

(b) Find : $L^{-1}\left[\frac{s^2-6s+7}{(s^2-4s+5)^2}\right]$. (7)

(OR)

10. (a) Find the Laplace transform of the funciton : $f(t)=\begin{cases} t, & 0<t<a \\ 2a-t, & a<t<2a \end{cases}$ and $f(t+2a)=f(t)$. (8)

(b) Solve by Laplace transform : $\frac{d^2y}{dt^2}-3\frac{dy}{dt}+2y=e^{3t}$ given $y(0)=y'(0)=0$. (7)

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B.E. DEGREE EXAMINATION, 2016

(FIRST SEMESTER)

SCLEC-104. ENGINEERING CHEMISTRY - I

(Common To ALL Branches)

May] [Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.

UNIT – I

1. (a) Explain the following boiler troubles :

(i) Scales and sludges. (ii) Caustic embrittlement. (6)

(b) Explain the softening method of hardwater by ion-exchange process. (9)

(OR)

2. (a) Draw and explain break point chlorination curve. (8)

(b) How would you determine the hardness of water by EDTA method? (7)

UNIT - II

3. (a) Derive Nernst equation. (8)

(b) Describe the construction and working of a galvanic cell. (7)

(OR)

4. (a) Explain the working principle of calomel electrode. (7)

(b) Bring out the applications of *emf* services. (8)

UNIT - III

5. (a) Explain the proximate analysis of coal. How is it carried out? (7)

(b) Describe fixed bed catalytic cracking process with a neat diagram. (8)

(OR)

6. (a) Explain the mechanism of petrol knocks. (7)

(b) How the flue gas analysis is carried out? Explain with neat diagram. Mention the significance of such analysis. (8)

UNIT - IV

7. (a) Write a note on solid lubricants. (8)

(b) Explain the following properties of a lubricant :

(i) Viscosity and viscosity index. (ii) Flash and fire point. (7)

(OR)

8. (a) What are adhesives? Explain the bonding process by adhesive. (8)

(b) Write short note on animal glues and casein glues. (7)

UNIT - V

9. (a) Explain adsorption chromatography with examples. (7)

(b) Derive Freundlich's adsorption isotherm. Write its limitations. (8)

(OR)

10. (a) What are the applications of adsorptions? (7)

(b) Explain the types of adsorption. (8)

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B.E. DEGREE EXAMINATION, 2016

(ANNUAL PATTERN)

(FIRST YEAR)

CLEC-105. ENGINEERING MECHANICS

(Common To ALL Branches)

May] [Time : 3 Hours

Maximum : 75 Marks

Answer any ONE FULL question from each unit.
ALL questions carry EQUAL marks.

UNIT – I

1. Explain the following :

   (a) Units and dimensions. (b) Free body diagram and

   (c) Classification of forces.

(OR)

2. A system of forces P, Q, R and S of magnitude 5 kN, 8 kN, 6 kN and 4 kN respectively acting on a body are shown in rectangular coordinates as shown in figure-1. Find the moments of the forces about the origin O. Also, find the resultant moment of the forces about O. The distancees are in metres.

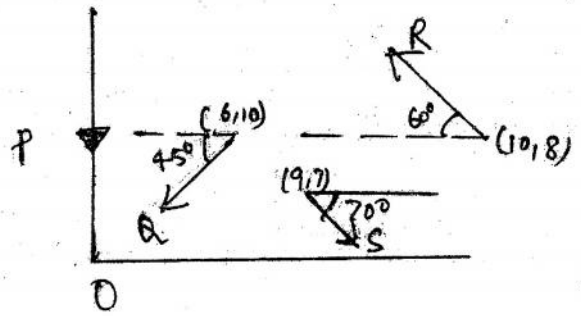

Figure-1

UNIT - II

3. The forces shown in figure-2 are in equilibrium. Find out the magnitude and location of force F.

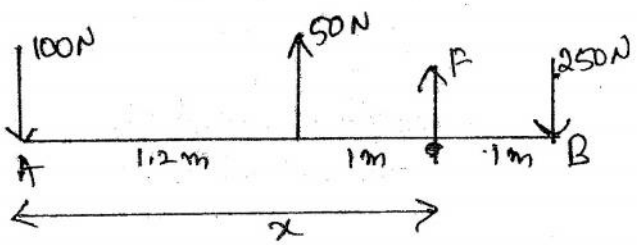

Figure-2

(OR)

4. (a) Explain the types of supports with neat sketches. (5)

   (b) Explain the different types of loads and types of beams. (10)

UNIT - III

5. Find the centroid of the plane area shown in figure-3.

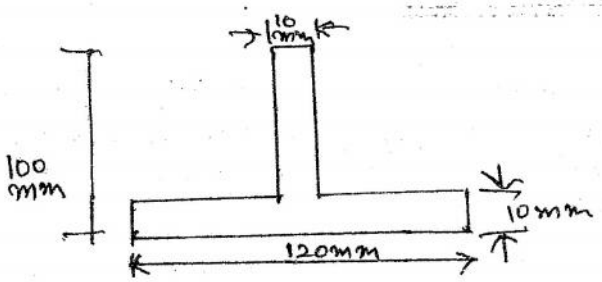

Figure-3

(OR)

6. Explain the following :

   (a) Parallel axis theorem. (b) Centre of gravity of a body.

   (c) Mass moment of intertia.

UNIT - IV

7. A compound bar consists of a central strip 40 mm wide and 5 mm thick placed between two strips of brass each of 40 mm wide and x cm thick. The strip are firmly fixed together to form a compound bar of rectangular section of 40 mm wide and (2x +5) mm thick. Determine the section of the brass strips which will be apparent modulus of elasticity of the compound bar equal to 160×10^3. E = 207 GN/m^3 Eb= 114 GN /m^3.

(OR)

8. Two parallel rods, one steel and other bronze are rigidly fastened at upper ends at a horizontal distance of 760 mm apart. Each rod is 3 m long and 25 mm in diameter. A horizontal cross piece connects the corner ends of the bar. Where should the load of 4·5 kN be placed on the cross piece so it remains horizontal after being loaded. Determine the stresses in each rod. $E_s = 210$ GN/m^2. $E_b = 112{\cdot}5$ GN/m^2.

UNIT - V

9. Write short notes on :

   (a) Mechanical advantage. (b) Pulley systems. (c) Velocity ratio.

(OR)

10. A screw jack has square threads of mean diameter of 10 cm and pitch 1·0 cm. Determine the force that must be applied at the end of the 40 cm lever

    (a) to raise a weight of 10 kN and (b) to lower a weight of 40 kN.