Code No: **19EET202** **R19**

I B. Tech II Semester Regular Examinations, December - 2020
BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING
(Common to CE, ME, CSE and IT)

Time : 3 hours **Max. Marks: 60**

Note : Answer **ONE** question from each unit (**5 × 12 = 60 Marks)**

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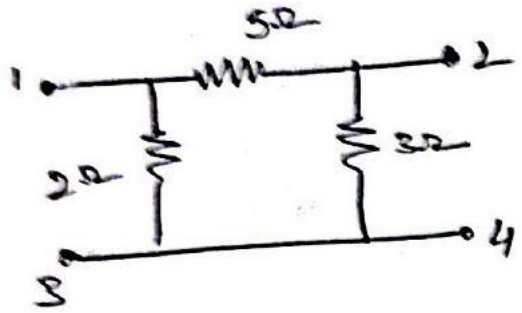
UNIT - I

1. a) Explain briefly about inductance and capacitance? Derive the necessary expressions for power and energy. 4M
   b) Give the statements of KCL and KVL with necessary diagrams and explanations. 4M
   c) Define peak factor and give its relation with r.m.s. value. 4M

(OR)

2. a) Identify the differences between series and parallel circuits. 6M
   b) Convert the following Π-network into its equivalent T-network using star delta transformation. 6M



UNIT – II

3. a) Explain the principle of operation of DC generator. 6M
   b) Explain the principle of operation of a DC motor. Classify the DC motors with the help of voltage and power equations. 6M

(OR)

4. a) Develop the emf equation of a DC generator. 6M
   b) A 4-pole DC motor is fed at 400V and taken armature current of 35A. The resistance of armature circuit is 0.2 ohm. The armature winding is wave connected with 800 conductors useful flux per pole is 0.023 wb. Calculate speed of the motor. 6M

UNIT – III

5. a) Explain the losses that occur in a transformer. 4M
   b) Explain the construction of slip ring induction motor. 4M
   c) Write the applications of induction motors 4M

(OR)

6. a) Explain the principle of operation of single phase transformer. 6M
   b) Explain the construction of squirrel cage induction motor. 6M
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UNIT –IV

7.	a)	Differentiate cut-in voltage and breakdown voltage in diodes.	4M
	b)	Draw the circuit diagram of full wave rectifier having two diodes and explain its operation.	4M
	c)	Define reverse breakdown voltage in diode.	4M

(OR)

8.	a)	Draw the characteristics of zener diode and write its applications	6M
	b)	Define avalanche region in diode characteristics.	6M

UNIT –V

9.	a)	Explain the operation of PNP transistor and draw its characteristics	6M
	b)	Draw the circuit and explain the characteristics of CB configuration.	6M

(OR)

10.	a)	Draw the circuit and explain the characteristics of CE configuration.	6M
	b)	Draw the input characteristics of CB configuration when $V_{CB2}>V_{CB1}$. Explain the operation.	6M

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Code No : **19MET201**

R19

I B. Tech II Semester Regular Examinations, December - 2020
ENGINEERING MECHANICS
(Common to CE and ME)

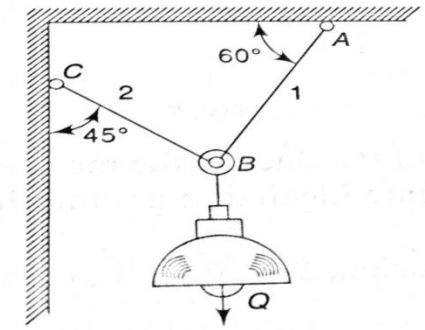
Time : 3 hours **Max. Marks : 60**

Note : Answer **ONE** question from each unit (**5 × 12 = 60 Marks)**

UNIT - I

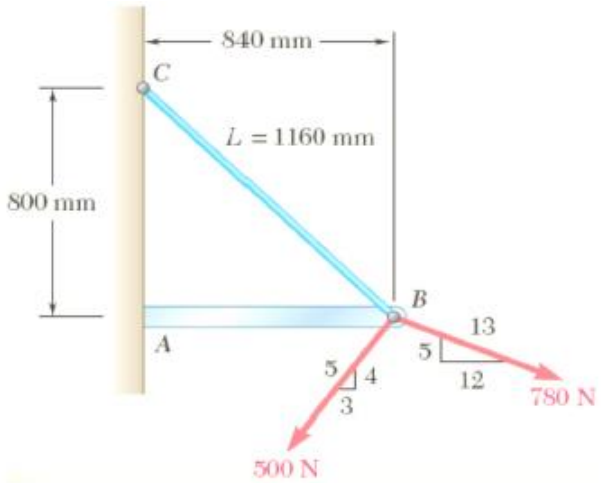
1. a) State the law of triangle of forces and Lami's theorem. 6M

   b) An electric light fixture of weight Q = 178 N is supported as shown. Determine the tensile forces S_1 and S_2 in the wires BA and BC if their angles of inclination are as shown 6M



(OR)

2. a) Tension in cable BC is 725 N. Determine the resultant of forces exerted at point B of beam AB. 6M



   b) Explain the following with examples 6M

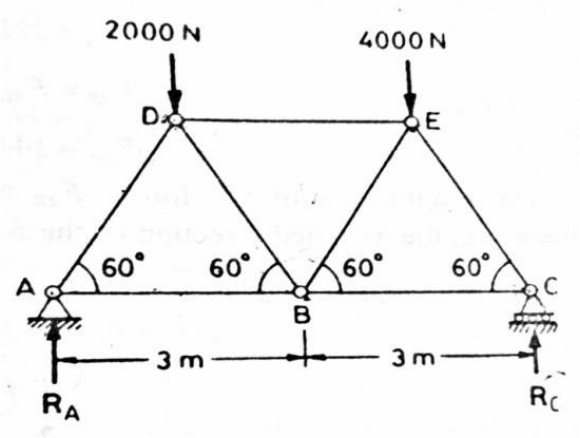
   (i) Concurrent forces

   (ii) Coplanar forces

   (iii) Collinear forces

UNIT – II

3. a) Using the method of joints, find the axial forces in all the members of a truss with the loading as shown. 8M

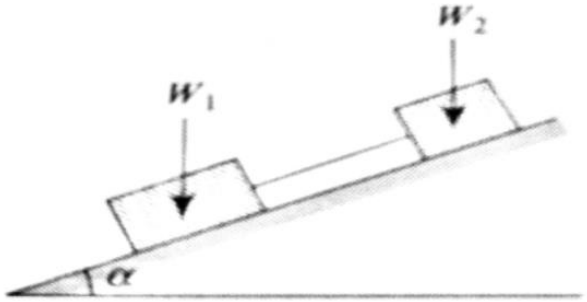


b) Define the friction and give its types 4M

(OR)

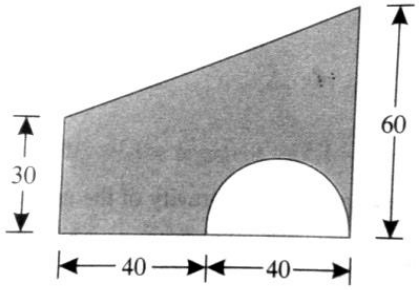
4. a) Describe the method of sections for finding forces in the members of a perfect truss. 4M

b) Two blocks of weights W_1 and W_2 connected with a string rest on a rough inclined plane as shown. If the coefficient of friction are 0.2 and 0.3 for the blocks respectively and $W_1=W_2=50N$, find the value of α for which the sliding will impend. 8M



UNIT – III

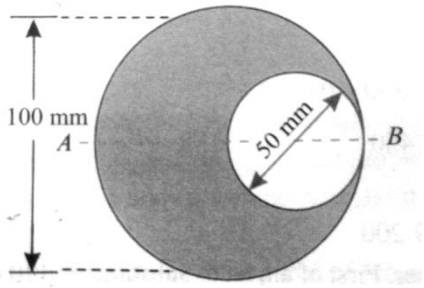
5. a) A semi circular area is removed from a trapezium as shown. Determine the centroid of remaining portion (shaded portion) (All dimensions are in mm). 6M



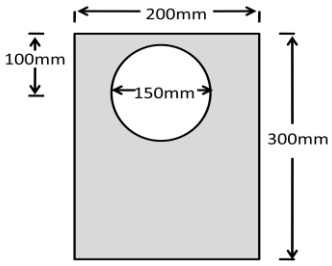
b) Calculate the moment of inertia of an I section having equal flanges 30 mm x 10 mm and web 30 mm x 10 mm about horizontal centroidal axis. 6M

(OR)

6. a) A circular hole of 50 mm diameter is cut out by a circular disk of 100 mm diameter as shown in figure. Find the centre of gravity of the section from point A. 6M



b) Find the moment of inertia of a hollow section shown about horizontal centroidal axis. 6M



UNIT –IV

7. a) A car is moving with a velocity of 15 m/sec. The car is brought to rest by applying brakes in 5 seconds. Determine i) the retardation ii) distance travelled by car after applying brakes. 6M

b) A particle is dropped from the top of a tower 100m high. Another particle is projected upwards at the same time from the foot of the tower and meets the first particle at a height of 30m. Find the velocity with which second particle is projected upwards. Take g = 9.8 m/sec^2 6M

(OR)

8. a) A ball is tossed with a velocity of 20 m/s directed vertically upward from a window located at 50 m above the ground. Determine 6M
   (i) Elevation of the ball above the ground
   (ii) Time and velocity when the ball hit the ground

b) A train starting from rest, is uniformly accelerated. The acceleration at any instant is $\frac{10}{v+1}$ m/s^2, where v is the velocity of the train in m/s at the instant. Find the distance, in which the train will attain a velocity of 35kmph 6M

UNIT –V

9. A ball impinges directly on a similar ball at rest. The first ball is reached to rest by the impact. Find the coefficient of restitution, if half of the initial kinetic energy is lost by impact. 12M

(OR)

10. A sphere of mass 1kg, moving at 3m/s, overtakes another sphere of mass 5kg moving in the same line at 60cm/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. 12M

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Code No : 19SHT201 **R19**

I B. Tech II Semester Regular Examinations, December - 2020
MATHEMATICS-II
(Common to ALL Branches)

Time : 3 hours **Max. Marks : 60**

Note : Answer **ONE** question from each unit (**5 × 12 = 60 Marks)**

UNIT - I

1. a) Find a real root of the eq. $x^3 - x - 1 = 0$ correct to three decimal places by Iteration method. 6M

   b) Solve the following system of equations by Jacobi's method starting with the solution (2, 3, 0) 6M
   $5x - y + z = 10$; $2x + 4y = 12$; $x + y + 5z = -1$

(OR)

2. a) Find a real root of the equation $x^4 - x - 9 = 0$ by Newton-Raphson method correct to three places of decimal. 6M

   b) Use method of false position to find the 4^{th} root of 32 correct to three decimal places. 6M

UNIT – II

3. a) Prove the following relations between the operators. 4M
   (i) $\Delta = E - 1$ (ii) $\nabla = 1 - E^{-1}$ (iii) $\delta = E^{1/2} - E^{-1/2}$ (iv) $\mu = \frac{1}{2}(E^{1/2} + E^{-1/2})$

   b) From the following table estimate the number of students who obtained marks between 40 and 45 by Newton's formula. 8M

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	31	42	51	35	31

(OR)

4. a) Use Gauss's forward formula to evaluate y_{30}, given that $y_{21} = 18.4708$; $y_{25} = 17.8144$; $y_{29} = 17.1070$; $y_{33} = 16.3432$; $y_{37} = 15.5154$. 6M

   b) Use Newton's divided difference formula to find f(9) for the following data 6M

x	5	7	11	13	17
f(x)	150	392	1452	2366	5202

UNIT – III

5. a) Evaluate $\int_0^6 \frac{1}{1+x^2}\,dx$ using (i) Trapezoidal rule (ii) Simpson's 3/8 rule by dividing into 6 equal sub intervals. 6M

   b) Apply Runge-Kutta Method to find an approximate value of y for x = 0.2 in steps of 0.1, if $\frac{dy}{dx} = x + y^2$ given that y = 1 when x = 0. 6M

(OR)

6. a) Using Picard's method obtain a solution up to the fifth approximation of the equation $\frac{dy}{dx} = x + y$ such that y = 1 when x = 0. 6M

   b) Using Modified Euler's method, find approximate value of y when x = 0.3, given $\frac{dy}{dx} = x + y$ and y = 1 when x = 0. 6M

UNIT –IV

7. a) Find $L(t^2e^{-2t}\cos t)$ 6M

b) Using Laplace transform, solve $(D^2 + 1)x = t\cos 2t$, given that $x = 0$, $\frac{dx}{dt} = 0$ at $t = 0$. 6M

(OR)

8. a) Evaluate $\int_0^\infty \frac{e^{-t} - e^{-2t}}{t}\,dt$, by using the Laplace transform. 6M

b) Find $L^{-1}\{\frac{1}{s(s^2+2s+2)}\}$ by using convolution theorem. 6M

UNIT –V

9. a) State Dirichlet's conditions for the expansion of a function in Fourier series. 2M

b) Find the Fourier cosine series over the interval $0 < x < 2$ for the function $f(x) = x$. 10M

(OR)

10. a) State Fourier integral theorem. 2M

b) Find the Fourier transform of $f(x) = \begin{cases} -1; & -1 \le x < 0 \\ 1; & 0 \le x \le 1 \\ 0; & \text{else where} \end{cases}$ 10M

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Code No: **19SHT202** **R19**

I B. Tech II Semester Regular Examinations, December - 2020
MATHEMATICS-III
(Common to ALL Branches)

Time: 3 hours **Max. Marks: 60**

Note : Answer **ONE** question from each unit (**5 × 12 = 60 Marks)**

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UNIT - I

1. a) Find rank of $A=\begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by reducing into Echelon form. 6M

   b) For what values of 'a' and 'b' the system of equations 6M
   $x + y + z = 6;\ x + 2y + 3z = 10;\ x + 2y + az = b$ has
   i) No solution ii) Unique solution iii) Infinite number of solutions.

OR

2. a) Find the Eigen values and the corresponding Eigen vectors of the matrix 6M
$$A=\begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$$

   b) Solve 5x + 10y + z = 28; 4x + 8y + 3z = 29; x + y + z = 6 by using Gauss Jordan method 6M

UNIT - II

3. a) Verify Cayley-Hamilton theorem for $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence find A^{-1} and A^4. 6M

   b) Reduce the matrix $A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ into diagonal matrix and find A^6. 6M

OR

4. Reduce the quadratic form $6x^2+3y^2+3z^2-4xy+4xz-2yz$ to a canonical form by orthogonal transformation method. Find Index, Rank, Signature and Nature of the quadratic form. 12M

UNIT - III

5. a) Calculate the angle between the normal to the surface $xy-z^2=9$ at points (4, 1, 2) and (3, 3, -3). 6M

   b) Find the values of a and b so that the surfaces $ax^2-byz=(a+2)x$ and $4x^2y+z^3=4$ intersect orthogonally at (1, -1, 2). 6M
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OR

6. a) Find a, b, c such that $\overline{F}=(2x+3y+az)\bar{i}+(bx+2y+3z)\bar{j}+(2x+cy+3z)\bar{k}$ is irrotational. 6M

b) Show that $\nabla^2 r^n = n\,(n+1)r^{n-2}$. 6M

UNIT – IV

7. Apply Green's theorem to evaluate $\oint_C (2xy-x^2)dx+(x^2+y^2)dy$ where C is the region bounded by $x = y^2$ and $y = x^2$. 12M

OR

8. a) If $\overline{F}=(5xy-6x^2)\bar{i}+(2y-4x)\bar{j}$ and C is the curve $y=x^3$ in xy - plane. Evaluate the line integral $\int_C \overline{F}\,.\,d\,\bar{r}$ from (1, 1) to (2, 8). 6M

b) Verify Stoke's theorem for $\overline{F}=(x^2+y^2)\bar{i}-2xy\,\bar{j}$ where taken around the rectangle bounded by the lines $x = \pm a$, $y = 0$, $y = b$. 6M

UNIT - V

9. a) Form a partial differential equation by eliminating arbitrary function from the equation $z = xy + f(x^2+y^2)$ 6M

b) Solve $(yz)p+(zx)q=xy$ 6M

OR

10. a) Solve $z^2(p^2+q^2+1)=1$ 6M

b) Solve $\left(D^2-4DD'+4D'^2\right)z=0$ 6M

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Code No: **19SHT204** **R19**

I B. Tech II Semester Regular Examinations, December - 2020
ENGINEERING CHEMISTRY
(Mechanical Engineering)

Time : 3 hours **Max. Marks: 60**

Note : Answer **ONE** question from each unit (**5 × 12 = 60 Marks)**

UNIT - I

1.	a)	Give the chemical equations involved in the preparation of polyurethanes.	4M
	b)	Justify the need of biodegradable polymers	3M
	c)	Explain the preparation of fibre-reinforced materials like CFRP and GFRP.	5M

(OR)

2.	a)	Compare and contrast the emulsion and suspension methods of polymerization.	4M
	b)	List out the drawbacks of natural rubber	3M
	c)	Describe the p- and n-type doping of polymers	5M

UNIT – II

3.	a)	Illustrate the working of lithium ion battery.	5M
	b)	Summarize the corrosion control methods	4M
	c)	Choose a fuel cell to provide drinking water to astronauts and give the chemical equations involved in it.	3M

(OR)

4.	a)	Select a suitable fuel cell to operate at high temperature out of hydrogen-oxygen, phosphoric acid and molten carbonate electrolyte fuel cells. Then explain its construction and functioning.	5M
	b)	Describe the electrochemical corrosion theory.	5M
	c)	Classify the cells based on the reusability and give one example for each category.	2M

UNIT – III

5.	a)	Classify the refractories.	3M
	b)	Demonstrate the preparation of nanomaterial by sol-gel method.	5M
	c)	Brief out the parameters to characterize the clinker formation.	4M

(OR)

6.	a)	Illustrate the characterization of nanomateriasl by TEM Method	5M
	b)	Describe the chemistry of setting and hardening of cement.	4M
	c)	Explain the any one mechanism of lubrication.	3M

UNIT –IV

7.	a)	Calculate the net calorific value of a coal sample having the following composition: C=80%, H=5%, O=4%, N=3%, S=3.5% and ash=5%	5M
	b)	Justify the usage of alternative fuels	4M
	c)	Differentiate HCV from LCV of a fuel.	3M

(OR)

8.	a)	Compare the Fischer-Tropsch process with Bergius process.	4M
	b)	Describe the usage of Orsat's apparatus for the analysis of flue gases.	4M
	c)	Explain octane and cetane ratings.	4M

UNIT –V

9.	a)	Describe the determination of hardness of water.	4M
	b)	List out the specifications of potable water	3M
	c)	Define the need for the removal of hardness of water in view of boiler troubles.	5M

(OR)

10.	a)	Select a best process out of zeolite and ion-exchange, for softening of hard water along with a proper explanation.	4M
	b)	Outline the treatment of industrial waste water.	4M
	c)	Illustrate the break point chlorination with a neat diagram.	4M

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