Code No: R161202 **R16** SET - 1

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**MATHEMATICS-II (MM)**
(Com. to CE, EEE, ME, CHEM, AE, BIO, AME, MM, PE, PCE, MET)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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## PART –A

1. a) Explain the Bisection method. (2M)
   b) Prove that $\Delta = E - 1$. (2M)
   c) Write Newton's forward interpolation formula. (2M)
   d) Write Trapezoidal rule and Simpson's 3/8$^{th}$ rule. (2M)
   e) Write the Fourier series for $f(x)$ in the interval $(0, 2\pi)$. (2M)
   f) Write One dimensional wave equation with boundary and initial conditions. (2M)
   g) If $F(s)$ is the complex Fourier transform of $f(x)$ , then prove that (2M)

$$F\{f(ax)\} = \frac{1}{a} F\left(\frac{s}{a}\right).$$

## PART –B

2. a) Using bisection method, obtain an approximate root of the equation $x^3 - x - 1 = 0$. (7M)
   b) Develop an Iterative formula to find the square root of a positive number $N$ using Newton-Raphson method. (7M)

3. a) Evaluate $\Delta^2 (\tan^{-1} x)$. (6M)
   b) Using Newton's forward formula, find the value of $f(1.6)$, if (8M)

| $x$ | 1 | 1.4 | 1.8 | 2.2 |
|---|---|---|---|---|
| $f(x)$ | 3.49 | 4.82 | 5.96 | 6.5 |
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4. a) Compute the value of $\int_{0.2}^{1.4} \left(\sin x - \log x + e^x\right) dx$ using Simpson's $\frac{3}{8}$ th rule. (7M)

   b) Using the fourth order Runge – Kutta formula, find $y(0.2)$ *and* $y(0.4)$ given that (7M)

   $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}, y(0) = 1.$

5. a) Find a Fourier series to represent $f(x) = x - x^2$ in $-\pi \le x \le \pi$ . Hence show that (7M)

   $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots\cdots = \frac{\pi^2}{12}$ .

   b) Obtain the half range sine series for $f(x) = e^x$ *in* $0 < x < 1$. (7M)

6. a) Solve by the method of separation of variables (7M)

   $4u_x + u_y = 3u$ *and* $u(0, y) = e^{-5y}$.

   b) A tightly stretched string with fixed end points $x = 0$ and $x = L$ is initially in a (7M)

   position given by $y = y_0 \sin^3\left(\frac{\pi x}{L}\right)$ if it is released from rest from this position,

   find the displacement $y(x,t)$.

7. a) Express the function $f(x) = \begin{cases} 1 & for \ |x| \le 1 \\ 0 & for \ |x| \ge 1 \end{cases}$ as a Fourier integral. Hence (7M)

   evaluate $\int_0^\infty \frac{\sin\lambda \cos\lambda x}{\lambda} d\lambda$.

   b) Find the Fourier transform of $f(x) = \begin{cases} 1 - x^2 & for \ |x| \le 1 \\ 0 & for \ |x| > 1 \end{cases}$ hence evaluate (7M)

   $\int_0^\infty \left(\frac{x\cos x - \sin x}{x^3}\right) \cos\frac{x}{2} \, dx$ .

Code No: R161202 **R16** SET - 2

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**MATHEMATICS-II (MM)**
(Com. to CE, EEE, ME, CHEM, AE, BIO, AME, MM, PE, PCE, MET)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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## PART –A

1. a) Explain the Method of false position. (2M)
   b) Prove that $\nabla = 1 - E^{-1}$. (2M)
   c) Write Newton's backward interpolation formula. (2M)
   d) Write Simpson's 1/3rd and 3/8th rule. (2M)
   e) Write the Fourier series for $f(x)$ in the interval $(0, 2L)$. (2M)
   f) Write the suitable solution of one dimensional wave equation. (2M)
   g) If $F(s)$ is the complex Fourier transform of $f(x)$, then prove that (2M)
   $F\{f(x-a)\} = e^{ias} F(s)$.

## PART -B

2. a) Using bisection method, compute the real root of the equation $x^3 - 4x + 1 = 0$. (7M)
   b) Develop an Iterative formula to find the cube root of a positive number $N$ using Newton-Raphson method. (7M)

3. a) Evaluate $\Delta (e^x \log 2x)$. (6M)
   b) Using Newton's forward formula compute $f(142)$ from the following table: (8M)

| $x$ | 140 | 150 | 160 | 170 | 180 |
|---|---|---|---|---|---|
| $f(x)$ | 3.685 | 4.854 | 6.302 | 8.076 | 10.225 |

4. a) Evaluate, $\int_0^2 e^{-x^2} dx$ by using Trapezoidal rule and Simpson's $\frac{1}{3}$ rd rule taking $h = 0.25$. (7M)
   b) Find the value of $y$ *at* $x = 0.1$ by Picard's method, given that (7M)
   $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$.
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5. a) Given that $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$. Find the Fourier series for $f(x)$. (7M)

Also deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\frac{1}{7^2}+ \cdots\cdots = \frac{\pi^2}{8}$.

b) Express $f(x) = x$ as a half-range cosine series in $0 < x < 2$. (7M)

6. a) Solve by the method of separation of variables (7M)

$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, *given* $u(x,0) = 6e^{-3x}$.

b) A string of length $L$ is initially at rest in equilibrium position and each of its points is given the velocity $\left(\frac{\partial y}{\partial t}\right)_{t=0} = b\sin^3\left(\frac{\pi x}{L}\right)$. Find displacement $y(x,t)$. (7M)

7. a) Express $f(x) = \begin{cases} 1 & for\ 0 \le x \le \pi \\ 0 & for\ x > \pi \end{cases}$ as a Fourier sine integral and hence evaluate (7M)

$\int_0^\infty \frac{1-\cos(\pi\lambda)}{\lambda}\sin(x\lambda)\,d\lambda$.

b) Find the Fourier sine and cosine transform of (7M)

$f(x) = e^{-ax}, a > 0, x > 0$.

Code No: R161202 **R16** SET - 3

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**MATHEMATICS-II (MM)**
(Com. to CE, EEE, ME, CHEM, AE, BIO, AME, MM, PE, PCE, MET)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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## PART –A

1. a) Explain the Newton-Raphson method. (2M)
   b) Prove that $\delta = E^{1/2} - E^{-1/2}$. (2M)
   c) Write Lagrange's interpolation formula for unequal intervals. (2M)
   d) Explain Taylor's series method for solving IVP $\frac{dy}{dx} = f(x, y)$ *with* $y(x_0) = y_0$. (2M)
   e) Write the Fourier series for $f(x)$ in the interval $(-\pi, \pi)$. (2M)
   f) Write the suitable solution of one dimensional heat equation. (2M)
   g) If $F(s)$ is the complex Fourier transform of $f(x)$ , then prove that (2M)

$$F\{ f(x)\cos ax \} = \frac{1}{2}\left[ F(s+a) + F(s-a) \right].$$

## PART –B

2. a) Using Regula-Falsi method, compute the real root of the equation $x^3 - 4x - 9 = 0$. (7M)
   b) Develop an Iterative formula to find $\frac{1}{N}$. Using Newton-Raphson method. (7M)

3. a) Evaluate $\Delta\left(\frac{x^2}{\cos 2x}\right)$. (6M)
   b) Compute $f(27)$ Using Lagrange's formula from the following table: (8M)

| $x$ | 14 | 17 | 31 | 35 |
|---|---|---|---|---|
| $f(x)$ | 68.7 | 64.0 | 44.0 | 39.1 |
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

4. a) Evaluate $\int_0^{0.6} e^{-x^2}\,dx$ by using Simpson's $\frac{1}{3}^{rd}$ rule taking seven ordinates. (7M)

   b) Given that $\frac{dy}{dx} = 2 + \sqrt{xy}$ , $y(1) = 1$ . (7M)

   Find $y(2)$ in steps of **0.2** using the Euler's method.

5. a) Find the Fourier series for the function $f(x) = \begin{cases} x & , \ 0 \le x \le \pi \\ 2\pi - x & , \ \pi \le x \le 2\pi \end{cases}$. (7M)

   Also deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \cdots\cdots = \frac{\pi^2}{8}$.

   b) Obtain the Fourier expansion of $f(x) = x \sin x$ as a cosine series in $(0, \pi)$. (7M)

6. Solve the Laplace's equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ in a rectangle in the $xy$-plane, $0 \le x \le a$ *and* $0 \le y \le b$ satisfying the following boundary condition $u(0, y) = 0$ , $u(a, y) = 0$ , $u(x, b) = 0$ *and* $u(x, 0) = f(x)$. (14M)

7. a) Find the Fourier sine transform of the function (7M)

   $$f(x) = \begin{cases} x & , 0 < x < 1 \\ 2 - x & , 1 < x < 2 \\ 0 & , \ x > 2 \end{cases} .$$

   b) Find the Fourier cosine integral and Fourier sine integral of (7M)
   $f(x) = e^{-kx}, k > 0$ .

Code No: R161202 **R16** SET - 4

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**MATHEMATICS-II (MM)**
(Com. to CE, EEE, ME, CHEM, AE, BIO, AME, MM, PE, PCE, MET)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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## PART –A

1. a) Explain Iteration method. (2M)
   b) Prove that $\mu = \frac{1}{2}\left(E^{1/2} + E^{-1/2}\right)$. (2M)
   c) Prove that $\Delta^3 y_2 = \nabla^3 y_5$. (2M)
   d) Explain Runge-Kutta method of fourth order for solving IVP (2M)
   $\frac{dy}{dx} = f(x, y)$ *with* $y(x_0) = y_0$.
   e) Write the Fourier series for $f(x)$ in the interval $(-L, L)$. (2M)
   f) Write the various possible solutions of two-dimensional Laplace equation. (2M)
   g) If $F(s)$ and $G(s)$ are the complex Fourier transform of $f(x)$ and $g(x)$, then prove that $F\{a\, f(x) + b\, g(x)\} = a\, F(s) + b\, G(s)$. (2M)

## PART –B

2. a) Find a positive real root of the equation $x^4 - x - 10 = 0$ using Newton-Raphson's method. (7M)
   b) Explain the bisection method. (7M)

3. a) Evaluate $\Delta^2(\cos 2x)$. (6M)
   b) Using Newton's backward formula compute $f(84)$ from the following table: (8M)

| $x$ | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|
| $f(x)$ | 184 | 204 | 226 | 250 | 276 | 304 |
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4. a) Evaluate $\int_0^1 e^{-x^2}dx$ by using Trapezoidal rule with $n=10$. (7M)

   b) Obtain Picard's second approximate solution of the initial value problem (7M)
   $\frac{dy}{dx}=\frac{x^2}{y^2+1}$ , $y(0)=0$ .

5. a) Obtain the Fourier series $f(x)=\left(\frac{\pi-x}{2}\right)^2$ in the interval $0 < x < 2\pi$. Deduce that (8M)
   $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\cdots\cdots=\frac{\pi^2}{6}$.

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

6. a) Solve by the method of separation of variables (7M)
   $\frac{\partial u}{\partial x}=4\frac{\partial u}{\partial y}$ *and* $u(0,y)=8e^{-3y}$.

   b) Solve the Laplace's equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$ in a rectangle in the $xy$-plane, $0\le x\le a$ *and* $0\le y\le b$ satisfying the following boundary condition $u(x,0)=0$ , $u(x,b)=0$ , $u(0,y)=0$ *and* $u(a,y)=f(y)$. (7M)

7. a) Find the Fourier cosine integral and Fourier sine integral of (7M)
   $f(x)=e^{-ax}-e^{-bx}$ , $a>0$ , $b>0$.

   b) Find the Fourier transform of $e^{-a^2x^2}$, $a>0$. Hence deduce that $e^{-\frac{x^2}{2}}$ is self reciprocal in respect of Fourier transform. (7M)

Code No: R161214 **R16** SET - 1

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**ELECTRICAL AND MECHANICAL TECHNOLOGY**
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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## PART –A

1. a) Write the operating principle of a DC generator. (2M)
   b) What are the applications of induction motor? (2M)
   c) Define controlling and damping torque. (2M)
   d) What is the function of vertical deflecting plate in a CRO? (2M)
   e) What do you understand by TDC and BDC? (2M)
   f) Explain the distinction between Absorptivity and Reflectivity. (2M)
   g) What is a Worm and a Worm wheel? Where is it used? (2M)

## PART –B

2. a) Derive the EMF equation of a DC generator. (7M)
   b) Explain construction and working of a single phase transformer. (7M)

3. a) Draw and explain slip-torque characteristics of an induction motor. (8M)
   b) An induction motor having 8- poles runs at 50 Hz supply. If it operates at full load at 720 rpm, calculate the slip. (6M)

4. Draw the block diagram of general purpose CRO. Explain the functions of various blocks. (14M)

5. a) Discuss in detail the differences between Four Stroke and Two Stroke engines. (6M)
   b) A certain engine with a bore of 250 mm has an indicated thermal efficiency of 30%. The brake specific fuel consumption and specific power output are 0.35 kg/kWh and 90 kW/$m^2$. Find the mechanical efficiency and brake thermal efficiency of the engine. Take the calorific value of the fuel as 42 MJ/kg. (8M)

6. a) Explain the effect of extended surfaces on heat transfer. Discuss in detail the classification of fins with neat sketches. (7M)
   b) A cubical tank of water of volume 1 $m^3$ is kept at a steady temperature of $65^0$C by a 1 kW heater. The heater is switched off. How long does the tank take to cool to $50^0$C, if the room temperature is $15^0$C? (7M)

7. a) How is a Lathe specified? Explain with a neat sketch the relevance of each of the specification points. (8M)
   b) Explain how Brazing is different from welding. Why is Brazing more extensively used in industrial practice? (6M)



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Code No: R161214 **R16** SET - 2

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**ELECTRICAL AND MECHANICAL TECHNOLOGY**
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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**PART –A**

| | | | |
|---|---|---|---|
| 1. | a) | Define regulation and efficiency of a transformer. | (2M) |
| | b) | Write principle of operation of an alternator. | (2M) |
| | c) | What is the difference between MC and MI instruments? | (2M) |
| | d) | Write the applications of DC series motor. | (2M) |
| | e) | What do you understand by (i) Brake Power; (ii) Specific Fuel Consumption | (2M) |
| | f) | Define Efficiency and Effectiveness of a Fin. | (2M) |
| | g) | What is the difference between Double-Helical and Herringbone gears? | (2M) |

**PART -B**

| | | | |
|---|---|---|---|
| 2. | a) | Derive the EMF equation of a single-phase transformer. | (7M) |
| | b) | An 8-pole, wave-connected armature has 600 conductors and is driven at 625 rev/min. If the flux per pole is 20 mWb, determine the generated e.m.f. | (7M) |
| 3. | a) | Explain how a rotating magnetic field is created in a three-phase induction motor when a balanced three-phase ac supply is applied at the stator terminals. | (7M) |
| | b) | A 3-phase, 60 Hz induction motor has 2 poles. If the slip is 2% at a certain load, determine (i) the synchronous speed, (ii) the speed of the rotor and (iii) the frequency of the induced e.m.f.'s in the rotor. | (7M) |
| 4. | a) | Explain the working principle of moving coil type ammeter with a neat diagram. | (7M) |
| | b) | Explain the terms deflection torque, controlling torque and damping torque. | (7M) |
| 5. | a) | Discuss in detail the differences between Spark Ignition and Compression Ignition engines. | (6M) |
| | b) | A four stroke Compression Ignition engine develops a brake power of 368 kW while 73.6 kW is used to overcome the friction losses. It consumes 180 kg/h of fuel at an air-fuel ratio of 20:1. The heating value of fuel is 42000 kJ/kg. Calculate (i) Indicated Power; (ii) Mechanical Efficiency; (iii) Indicated Thermal Efficiency; (iv) Brake Thermal Efficiency. | (8M) |
| 6. | a) | Discuss in detail the differences between Forced and Natural Convection. | (6M) |
| | b) | A thin metallic plate is insulated at the back surface and is exposed to the sun at the front surface. The front surface absorbs solar radiation at 900 $W/m^2$ and dissipates it mainly by convection to the ambient air at $30^0C$. If the heat transfer coefficient between the plate and the air is 15 $W/m^2K$, what is the temperature of the plate? | (8M) |
| 7. | a) | Distinguish between Arc and Gas welding processes from the point of view of Heat concentration, Temperature, Ease of operation and Running cost. | (8M) |
| | b) | What is the requirement of fluxes in Brazing? Give details of some of the fluxes used in brazing with their applications. | (6M) |
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Code No: R161214 **R16** SET - 3

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**ELECTRICAL AND MECHANICAL TECHNOLOGY**
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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**PART –A**

1. a) List out different losses that occur in a transformer. (2M)
   b) Define slip. Give its significance in an induction motor. (2M)
   c) What is the difference between wattmeter and energy meter? (2M)
   d) What is the disadvantage with armature resistance speed control method? (2M)
   e) What do you understand by (i) Frictional Power; (ii) Brake Thermal Efficiency (2M)
   f) Explain the distinction between Laminar and Turbulent flows. (2M)
   g) Name the different gears used for (i) Parallel shafts; (ii) Intersecting shafts. (2M)

**PART -B**

2. a) Explain the operation of 3-point starter with a neat diagram. (7M)
   b) A 200 kVA rated transformer has a full-load copper loss of 1.5 kW and an iron loss of 1 kW. Determine the transformer efficiency at full load and half load for 0.85 power factor. (7M)

3. a) Explain the construction and working principle of a three phase induction motor. (8M)
   b) The frequency of the supply to the stator of a 6-pole induction motor is 50 Hz and the rotor frequency is 2 Hz. Determine (i) the slip, and (ii) the rotor speed in rev/min. (6M)

4. a) Explain the working of a single phase wattmeter. (7M)
   b) Explain the working principle of a moving iron type voltmeter. (7M)

5. a) Discuss in detail the differences between Renewable and non Renewable energy resources. (7M)
   b) What are the important basic components of an Internal Combustion engine? Explain them briefly. (7M)

6. a) Discuss in detail, Fourier's law of Heat conduction. What are the assumptions made? (6M)
   b) An immersion water heater of surface area 0.1 $m^2$ and rating 1 kW is designed to operate fully submerged in water. Estimate the surface temperature of the heater when the water is at $40^0$C and the heat transfer coefficient is 300 W/$m^2$K. If this heater is by mistake used in air at $40^0$C with heat transfer coefficient of 9 W/$m^2$K, what will be the surface temperature? (8M)

7. a) Explain the resistance welding process giving the equipment, parameters controlled and the applications. (7M)
   b) Distinguish between Brazing and soldering from the point of view of the filler metals used, applications and the strength of the joint obtained. (7M)
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Code No: R161214 **R16** SET - 4

**I B. Tech II Semester Regular Examinations, April/May - 2017**
**ELECTRICAL AND MECHANICAL TECHNOLOGY**
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is Compulsory
3. Answer any **FOUR** Questions from **Part-B**

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**PART –A**

1. a) What is the function of starter in a DC machine? (2M)
   b) What is the operating principle of an induction machine? (2M)
   c) What is the function of horizontal deflecting plate in a CRO? (2M)
   d) What are different types of DC machines? (2M)
   e) What do you understand by (i) Indicated Thermal Efficiency; (ii) Mechanical Efficiency? (2M)
   f) Explain Radiation Intensity of a Black body. (2M)
   g) What do you mean by Initial Tension in a Belt Drive? (2M)

**PART -B**

2. a) Explain various methods of speed control of DC Motor. (7M)
   b) A 4500 V/225 V, 50 Hz single-phase transformer is to have an approximate e.m.f. per turn of 15 V and operate with a maximum flux of 1.4 T. Calculate (i) the number of primary and secondary turns and (ii) the cross-sectional area of the core. (7M)

3. a) Explain the synchronous impedance method to determine the regulation of an alternator. (8M)
   b) Discuss the applications of induction motor. (6M)

4. a) Explain the working of single phase energy meter. (7M)
   b) Compare and contrast between MI and MC instruments. (7M)

5. a) Classify the Internal Combustion engine with respect to: (i) Cycle of operation; (ii) Type of Ignition; (iii) Types of fuels used; (iv) Type of cooling. (6M)
   b) A petrol engine uses a fuel of calorific value of 42000 kJ/kg and has a specific gravity of 0.75. The brake thermal efficiency is 24% and mechanical efficiency is 80%. If the engine develops a brake power of 29.44 kW, calculate (i) Volume of fuel consumed per second; (ii) Indicated thermal efficiency. (8M)

6. a) Explain the different modes of Heat Transfer in detail. (7M)
   b) A circular plate of 0.2 m diameter has one of its surfaces insulated, and the other is maintained at 550K. If the hot surface has an emissivity of 0.9 and is exposed to the air at 300K, calculate the heat loss by radiation from the plate to the air. (7M)

7. a) What are the specific advantages and disadvantages of the resistance welding process? (5M)
   b) Explain briefly the procedure of the manual metal arc welding process. (5M)
   c) Explain how Extrusion is compared with Rolling. (4M)
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**Subject Code: R13203/R13** **Set No - 1**

**I B. Tech II Semester Supplementary Examinations April/May - 2017**

# ENGINEERING PHYSICS

(Com. to CE, ME, CSE, PCE, IT, CHEM, AE, AME, MM, PE, MTE, TE)

**Time: 3 hours** **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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## PART-A

1. (a) What is polarization? Explain double refraction in crystals.
   (b) What are Bravais lattices? Define primitive cell and unit cell.
   (c) What are SQUIDS?
   (d) Convert Maxwell's first equation (Gauss law of electrostatics) from integral to differential form.
   (e) What is meant by Fermi energy? What is its physical significance?
   (f) Distinguish between intrinsic and extrinsic semiconductors.
   [3+4+4+3+4+4]

## PART-B

2. (a) Explain the concept of interference in thin films with necessary theory.
   (b) In Newton's rings experiment, diameter of $10^{th}$ dark ring in air when viewed under reflected light of wavelength $6000A^o$ is 0.5 cm. Find the radius of curvature of the lens.
   (c) Distinguish between Type-I and Type-II superconductors. [8+4+4]

3. (a) Explain the principle of propagation of light through optical fiber.
   (b) Derive an expression for acceptance angle and numerical aperture of an optical fiber.
   (c) Calculate the number of atoms per unit cell, atomic radius, coordination number and packing factor for Body Centered Cubic structure. [4+8+4]

4. (a) Derive an expression for the internal field in dielectric solid materials.
   (b) Write short notes on LED and solar cell. [8+8]

5. (a) State and explain Sabine's formula for reverberation time of a hall.
   (b) Derive the Schrodinger's time independent wave equation. [8+8]

6. (a) Explain the meaning of density of states. Derive an expression for the number of allowed states per unit volume of a solid.
   (b) Draw and explain B-H curve for a ferromagnetic material. [8+8]

7. (a) Derive an expression for the charge density in terms of Hall voltage and further explain how the mobility of the charge carriers can be evaluated by knowing the conductivity.
   (b) A 100μm thick sample of silicon is doped with $10^{28}$ phosphorous atoms/$m^3$. Find the Hall voltage in the sample if it carries a current of 1mA and is placed in a magnetic field of $0.1Wb/m^2$ (assume electron mobility=$0.07m^2/V.s$).
   (c) Distinguish between interference and diffraction. [8+4+4]

**Subject Code: R13210/R13** **Set No - 1**

## I B. Tech II Semester Supplementary Examinations April/May - 2017
# ENGINEERING MECHANICS
(Com. to ECE, EEE, EIE, BOT, E Com E, AGE)

**Time: 3 hours** **Max. Marks: 70**

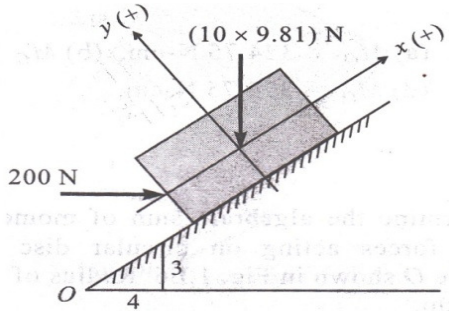
Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

## PART-A

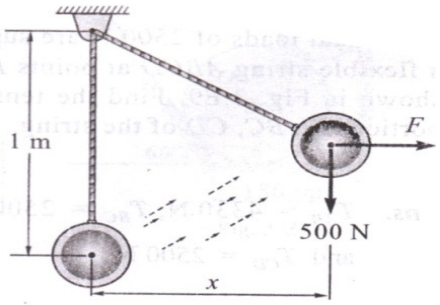
1. a) Define (i) Angle of friction (ii) Cone of friction. [4]
   b) Discuss the equilibrium equations for a body in space. [3]
   c) State Pappu's theorems. [3]
   d) State and explain perpendicular axis theorem. [4]
   e) A particle moves in a circular path of 0.3 m radius. Calculate the acceleration if speed is 0.6 m/s but increasing at the rate of 0.9 m/s$^2$ each second. [4]
   f) Discuss the advantages of work-energy theorem. [4]

## PART-B

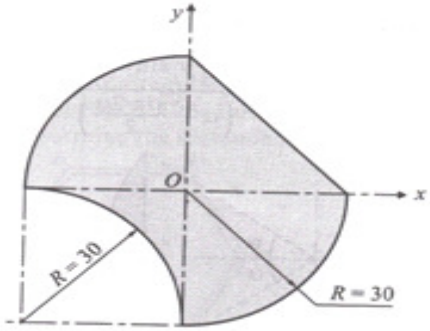
2. a) Define: (i) coefficient of friction (ii) Moment of force. [4]
   b) The block having a mass of 10kg is placed on an inclined plane is subjected to horizontal and vertical forces as shown in the figure. Find the algebraic sum of component of forces along x and y axis such that x-axis is parallel and y-axis is perpendicular to the inclined. [12]



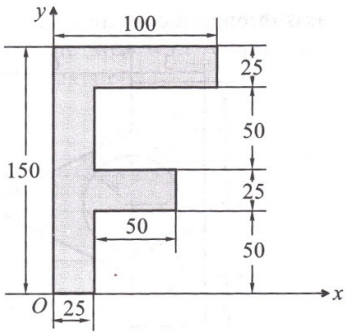

3. a) Explain coplanar concurrent force system. [4]
   b) Find the horizontal distance to which a 1m long in extensible string holding weight of 500N can be pulled before the string breaks. The string can withstand the maximum pull of 1000N as shown in the figure. Determine also the required force F. [12]



4. a) Determine an expression for the center of gravity of a right circular solid cone about is base from first principles. [8]
   b) Determine the centroid of the shaded portion given in the figure (All dimensions in mm). [8]

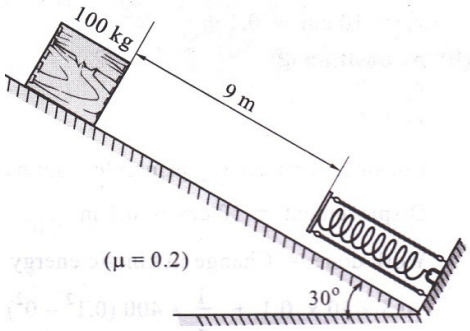



5. a) Determine the moment of inertia for a circle of radius r about the diameter. [8]
   b) Find the Moment of Inertia about the centroidal axis for the given figure (All dimensions are in mm). [8]




6. a) When the angular velocity of a 1.2 m dia pulley is 3 rad/s, the total acceleration of a point on its rim is 9 m/s$^2$. Determine the angular acceleration of the pulley at this instance. [6]
   b) A train is uniformly accelerated and passes successive kilometer stones with velocities of 18 kmph and 36 kmph respectively. Calculate the velocity when it passes the third kilometer stone. Also find the time taken for each of the two intervals of one kilometer. [10]

7. a) Discuss the energy of motion for a rigid body rotating about a fixed axis. [6]
   b) A spring is used to stop a 100 kg package which is moving down a 30$^0$ incline. The spring has a constant k=30 kN/m and is held by cables so that it is initially compressed 90 mm. If the velocity of the package is 5 m/s and it is 9 m from the spring, determine the maximum additional deformation of the spring in bringing the package to rest. Assume coefficient of friction as 0.2. [10]



**Subject Code: R10204/R10** **Set No - 1**

**I B. Tech II Semester Supplementary Examinations April/May - 2017**
**ENGINEERING CHEMISTRY-II**
(Common to All Branches)

**Time: 3 hours** **Max. Marks: 75**

Answer any **FIVE** Questions
**All** Questions carry equal marks
* * * * *

1. a) Give the mechanism of addition polymerization and condensation polymerization. What is the minimum functionality required for a monomer to form a crossed-linked polymer?
   b) Write the structures and two properties and two uses of : i) PTFE ii) Bakelite (8+7)

2. a) Explain the functions of different ingredients used in compounding of plastics.
   b) Write a note on fibre reinforced plastics. (8+7)

3. a) How are they following produced? (i)Buna-N ii) Polyurethane. Mention their properties and uses.
   b) Explain the process of vulcanization of rubber. (8+7)

4. a) Discuss any two methods for the synthesis of carbon nanotubes.
   b) Write a short note on quantum dots and nanowires. (8+7)

5. a) What are the constituents of cement? Discuss the mechanism of setting and hardening of cement.
   b) Explain liquid glazing of ceramics. (8+7)

6. a) What do you understand with the knocking of a fuel? Report the ways to improve the anti knocking characteristics of a fuel.
   b) Explain the mechanism of lubrication process. (8+7)

7. a) Discuss the various factors influencing the rate of corrosion.
   b) What are different types of corrosion resistant floor finishes? Explain. (8+7)

8. a) Explain any two methods for green synthesis.
   b) What are the green chemistry principles? (8+7)