Hall Ticket Number :										

R-20

Code: 20AC21T

I B.Tech. II Semester Regular & Supplementary Examinations September 2022

Differential Equations and Vector Calculus

(Common to all Branches)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer ALL the following short answer questions (5 X 2 = 10M)

		CO	BL
a)	Solve $\frac{d^4x}{dt^4} + 4x = 0$	CO1	L3
b)	Write the second order Legendre's Linear equation form.	CO2	L3
c)	Form the differential equation by eliminating a and b from $\log(az-1) = x + ay + b.$	CO3	L2
d)	Find the greatest value of the directional derivative of the function $f = x^2yz^3$ at $(2,1,-1).$	CO4	L2
e)	State stokes theorem.	CO5	L3

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	Blooms Level
	UNIT–I			
2.	Solve $(D-2)^2 = 8\left(e^{2x} + \sin 2x + x^2\right)$	12M	CO1	L3
	OR			
3.	Solve the differential equation $(D^2+4)y = \sec 2x$ by the method of variation of parameters.	12M	CO1	L3
	UNIT–II			
4.	A condenser of capacity C discharged through an inductance L and resistance R in series and the charge q at time t satisfies the equation $L\frac{d^2q}{dt^2} + R\frac{dq}{dt} + \frac{q}{C} = 0.$ Given that L= 0.25 henries, R = 250 ohms, $C = 2\times10^{-6}$ farads, and that when t = 0, charge q is 0.002 coulombs and the current $dq/dt = 0,$ obtain the value of q in terms of t.	12M	CO2	L3
	OR			

5.		Solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=\log x\,.\sin(\log x)$	12M	CO2	L1

UNIT–III

6.	a)	Form a partial differential equation by eliminating the arbitrary functions f(x) and g(y) from $z=y\,f(x)+x\,g(y)$.	6M	CO3	L2
	b)	Solve $x^2(y-z)p+y^2(z-x)q=z^2(x-y)$.	6M	CO3	L3

OR

7.		Solve by the method of separation of variables $3u_x+2u_y=0$ where $u(x,0)=4e^{-x}$.	12M	CO3	L3

UNIT–IV

8.	a)	Find the directional derivative of $\phi=x^2yz+4xz^2$ at (1, -2, -1) in the direction of the vector $2\bar{i}-\bar{j}-2\bar{k}$.	6M	CO4	L2
	b)	Show that $\nabla^2(r^n)=n(n+1)r^{n-2}$.	6M	CO4	L3

OR

9.	a)	Find the angle between the surfaces $x^2+y^2+z^2=9$ and $z=x^2+y^2-3$ at the point (2, -1, 2).	6M	CO4	L2
	b)	Find whether the function $\bar{F}=(x^2-y^3)\bar{i}+(y^2-3x)\bar{j}+(z^2-xy)\bar{k}$ is irrotational and hence find scalar potential function corresponding to it.	6M	CO4	L2

UNIT–V

10.	a)	Find the work done in moving a particle in the force field $\bar{F}=3x^2\bar{i}+(2xz-y)\bar{j}+z\bar{k}$ along the straight line from (0,0,0) to (2,1,3)	6M	CO5	L2
	b)	Apply Divergence theorem to evaluate $\iint_s (x+z)\,dy\,dz+(y+z)\,dz\,dx+(x+y)\,dx\,dy$ where s is the surface of the sphere $x^2+y^2+z^2=4$.	6M	CO5	L3

OR

11.		Verify Green's theorem in the plane for $\int_c (x^2-xy^3)\,dx+(y^2-2xy)\,dy$ where c is a square with vertices (0, 0), (2, 0), (2, 2), (0, 2).	12M	CO5	L5

*** End ***

Hall Ticket Number :										

R-20

Code: 20A322T

I B.Tech. II Semester Regular & Supplementary Examinations September 2022

Engineering Graphics & Design

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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		Marks	CO	Blooms Level
	UNIT–I			
1.	Draw the projections of a pentagonal prism of base side 40mm and axis length 80 mm rests on the HP on one of the base corners. The axis is inclined at 45^0 to the HP and parallel to the VP.	14M	CO1	L2
	OR			
2.	A cylinder of 40 mm diameter, height 70 mm is resting on a point on the circumference of base circle in H.P, such that its axis is inclined at 30^0 to H.P and top view of the axis is inclined at 40^0 to V.P. Draw the projections.	14M	CO1	L2
	UNIT–II			
3.	A cone of 40 mm diameter 70 mm height is resting on its base in H.P. It is cut by a section plane perpendicular to V.P, parallel to one of the generators and passes through a point 15 mm below the apex. Draw the sectional top view and true shape of section.	14M	CO2	L3
	OR			
4.	A pentagonal prism with 25 mm edges at its base and the axis 50 mm long, rests on one of its rectangular faces with the axis inclined at 30^0 to the VP. It is cut by a cutting plane perpendicular to the VP, inclined at 45^0 to the HP and passing through the Centre of one base so that a smaller part of the object is removed. Draw the front view, sectional top view, and true shape of the section.	14M	CO2	L3
	UNIT–III			
5.	A square prism, edge of base 30 mm and axis 60 mm long, has its base on the HP, and its faces are equally inclined to the VP. It is cut by a plane perpendicular to the VP, inclined at 60^0 to the HP and passing through a point 45 mm above the base along the axis. Draw the development of the lower portion of the prism.	14M	CO3	L3
	OR			
6.	A vertical square prism, base 50 mm side is completely penetrated by a horizontal square prism, base 35 mm side so that their axes are bisecting. The axis of the horizontal prism is parallel to the V.P., while the faces of both prisms are equally inclined to the V.P. Draw the projections of the prisms showing lines of intersection.	14M	CO3	L3

UNIT–IV

7. a) Draw the isometric projection of a hexagonal pyramid of edge of base 40mm and axis 70 mm long when its axis is vertical. 7M CO4 L2

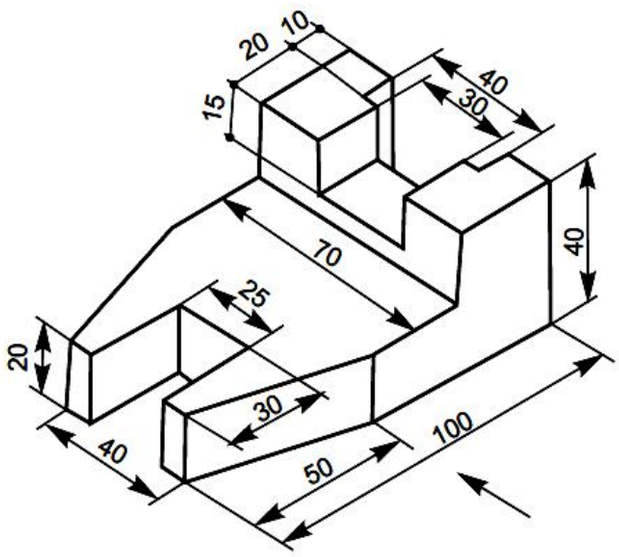
   b) Draw the isometric projection of a circle of diameter 60 mm whose surface is (i) horizontal and (ii) vertical. 7M CO4 L2

OR

8. A square pyramid is placed over a cube of edge 50 mm such that the corners of the base of the pyramid touch the mid-points of the top face of the cube. Draw the isometric projection of the assembly. The axis of the pyramid is 60mm. 14M CO4 L3

UNIT–V

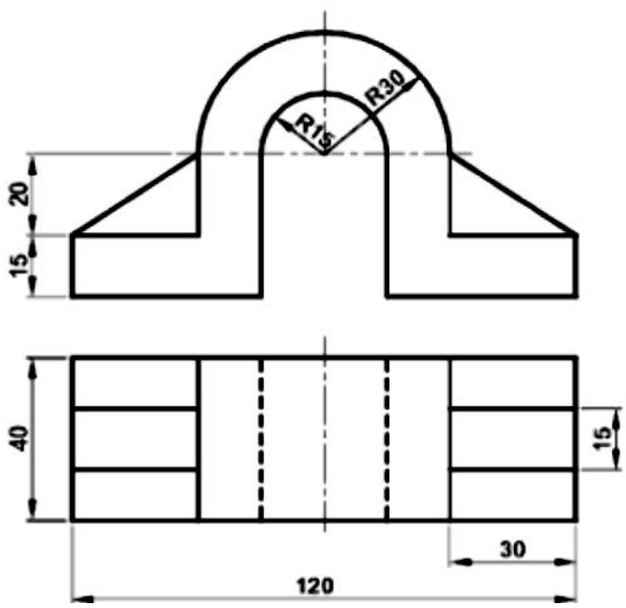
9. Draw the front view, top view and left side view for the following figure. (Dimensions are in mm).



14M CO5 L4

OR

10. The front and top views of an object are shown in below figure. Draw its isometric view. (Dimensions are in mm).



14M CO5 L4

*** End ***

Hall Ticket Number :										

R-20

Code: 20A321T

I B.Tech. II Semester Regular & Supplementary Examinations September 2022

Engineering Materials

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

1. Answer ALL the following short answer questions (5 X 2 = 10M)	CO	Blooms Level
a) What is interstitial impurity atom	**CO1**	**L2**
b) What is the percentage carbon at which the eutectic and eutectoid reactions occur in Fe -Fe3C meta stable equilibrium	**CO2**	**L2**
c) Draw the microstructure of nodular cast iron	**CO3**	**L1**
d) What is diffusion coating? Mention its purpose.	**CO4**	**L2**
e) What is a cermet? Give two examples.	**CO5**	**L2**

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	Blooms Level
	UNIT–I			
2. a)	Explain the factors effecting the grain growth during the process of crystallization. Give any two methods to reduce the grain size during solidification.	6M	CO1	L2
b)	What is a metallic bond? Give some examples	6M	CO1	L1
	OR			
3. a)	Differentiate between substitutional and interstitial solid solutions with neat sketches. Give examples for each	6M	CO1	L2
b)	Explain one dimensional defects in solids	6M	CO1	L2
	UNIT–II			
4. a)	Explain eutectic system with help of Bi-Cd system	6M	CO2	L2
b)	State lever rule and where it is used	6M	CO2	L1
	OR			
5.	Draw Fe -Fe3C meta stable equilibrium diagram and explain all the invariant reactions and phases	12M	CO2	L2

UNIT–III

6.	a)	Classify steels based on carbon percentage and percentage of alloying elements.	6M	CO3	L4
	b)	Write about any two types of alpha and beta brasses	6M	CO3	L1
		OR			
7.	a)	Write about malleable cast iron and its applications.	6M	CO3	L1
	b)	Explain the structure and properties of Al and its alloys.	6M	CO3	L2

UNIT–IV

8.	a)	Explain flame hardening with the help of a diagram	6M	CO4	L2
	b)	Illusatrate the need for tempering treatment after hardening in steels	6M	CO4	L3
		OR			
9.	a)	Explain the heat treatment cycle in annealing of high carbon steels. List the advantages of it.	6M	CO4	L2
	b)	Explain the effect of addition of Ti, Mo, Si, Mn on the eutectoid temperature in Iron carbide diagram	6M	CO4	L2

UNIT–V

10.	a)	Classify the composite materials and mention the advantages of composites	6M	CO5	L4
	b)	Write about different types of glasses and their applications	6M	CO5	L1
		OR			
11.	a)	Explain vacuum bag moulding with the help of a sketch	6M	CO5	L2
	b)	What are the different types of fibers used in composite materials	6M	CO5	L2

*** End ***

Hall Ticket Number :										

R-20

Code: 20A323T

I B.Tech. II Semester Regular & Supplementary Examinations September 2022

Engineering Mechanics

(Common to CE & ME)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

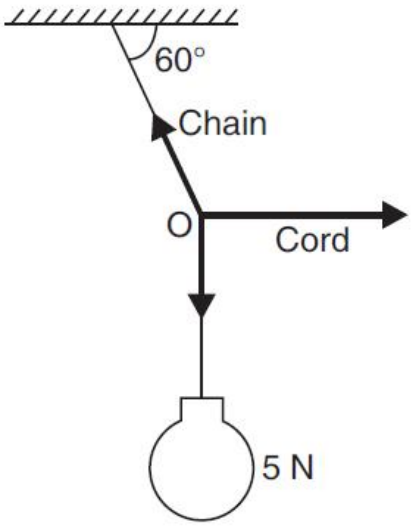
PART-A

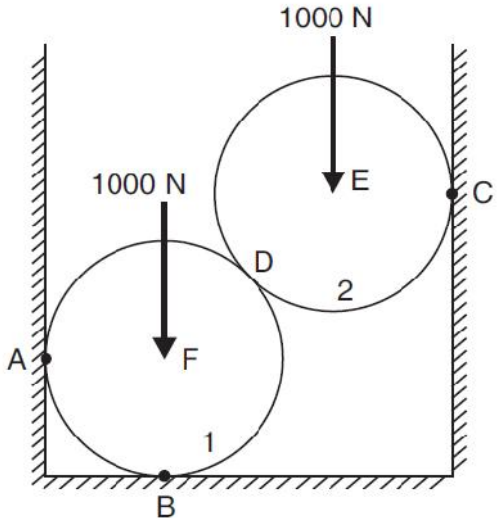
(Compulsory question)

		CO	Blooms Level
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	What is a force? State parallelogram law of forces.	**1**	**1**
b)	What are the assumptions in the analysis of plane trusses?	**2**	**2**
c)	Differentiate centroid and center of gravity.	**3**	**2**
d)	What is the difference between rectilinear and curvilinear translations?	**4**	**2**
e)	What is D'Alembert's principle in translation?	**5**	**1**

PART-B

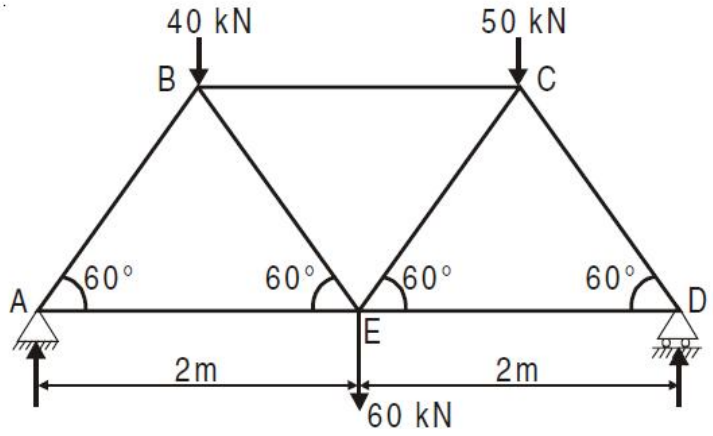
Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	Blooms Level
	UNIT–I			
2.	A lamp weighing 5 N is suspended from the ceiling by a chain. It is pulled aside by a horizontal cord until the chain makes an angle of 60° with the ceiling as shown in Fig. Find the tensions in the chain and the cord by applying Lami's theorem. 	12M	1	3
	OR			
3.	Two spheres, each of weight 1000 N and of radius 25 cm rest in a horizontal channel of width 90 cm as shown in Fig. Find the reactions on the points of contact A, B and C.	12M	1	3



UNIT–II

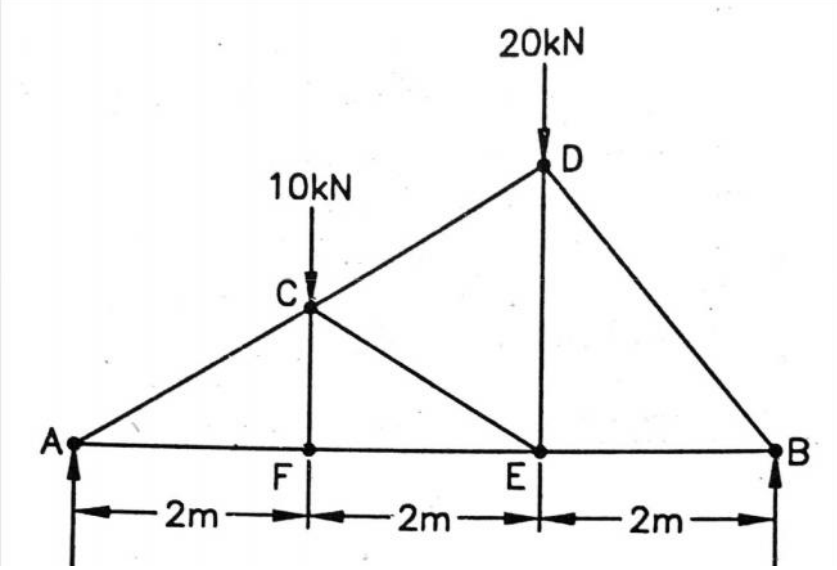
4. Determine the forces in all the members of the truss shown in Fig. and indicate the magnitude and nature of forces on the diagram of the truss. All inclined members are at 60° to horizontal and length of each member is 2 m.



12M 2 3

OR

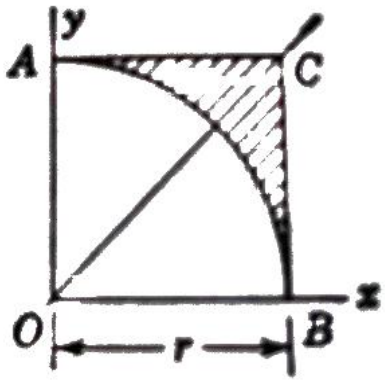
5. Find by method of sections the forces in members CD, CE, CF and EF of the freely supported planar truss shown in Fig.



12M 2 3

UNIT–III

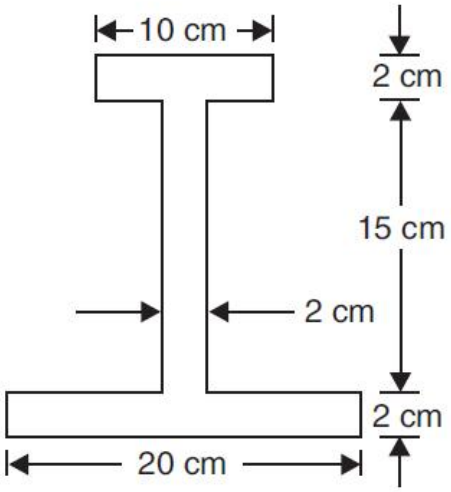
6. Find the centroid of the shaded area ACB in Fig. with respect to the X and Y axes shown.



12M 3 3

OR

7. Find the centre of gravity of the I-section shown in Fig.



12M 3 3

UNIT–IV

8. A particle moves along a straight line so that its displacement is metre from a fixed point is given by, $S=2t^3+4t^2-6t+8$ Find : (*i*) velocity at start, (*ii*) velocity after 5 seconds, (*iii*) acceleration at start and (*iv*) acceleration after 5 seconds. 12M 4 3

OR

9. a) Explain about kinematics of rotation of a rigid body. 4M 4 2

   b) The armature of an electric motor has angular speed N=1800 rpm at the instant when the power is cut off. If it comes to rest in 6 seconds,

   (i) Calculate the angular deceleration α assuming that it is constant.

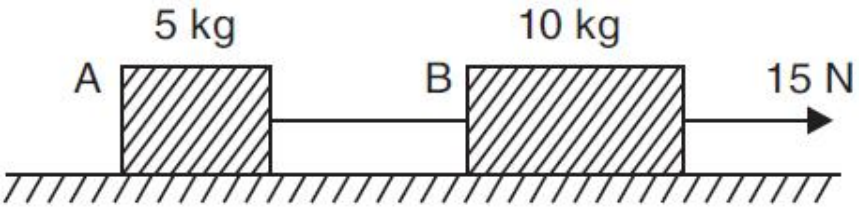
   (ii) How many complete revolutions does the armature make during this period? 8M 4 3

UNIT–V

10. A train of weight 2000 kN is pulled by an engine on a level track at a constant speed of 36 kilometre per hour. The resistance due to friction is 10 N per kN of the trains weight. Find the power of the engine. 12M 5 3

OR

11. Find the acceleration of bodies and tension in the string joining A and B shown in Fig.



12M 5 3

*** End ***

Hall Ticket Number :										

R-20

Code: 20AC24T

I B.Tech. II Semester Regular & Supplementary Examinations September 2022

Engineering Physics

(Common to CE & ME)

Max. Marks: 70 Time: 3 Hours

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Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. In Part-A, each question carries **Two mark.**
3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

		CO	Blooms Level
1.	**Answer ALL the following short answer questions** (5 X 2 = 10M)		
a)	What is a conservative force and give its expression?	CO1	L2
b)	What is reverberation and give Sabine's formula?	CO2	L2
c)	What are dielectrics?	CO3	L2
d)	What are the characteristics of a laser?	CO4	L2
e)	What is a 'sensor'?	CO5	L2

PART-B

Answer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

		Marks	CO	Blooms Level
	UNIT–I			
2. a)	Give the physical significance of the terms Gradient of a scalar, divergence and curl of a vector.	6M	CO1	L3
b)	What are the three laws of Kepler and explain them.	6M	CO1	L3
	OR			
3. a)	Differentiate Newton's laws in inertial and non-inertial frames of reference.	7M	CO1	L2
b)	For a mass 'm' moving with velocity v along 'x' axis and write the angular moment about the origin.	5M	CO1	L3
	UNIT–II			
4. a)	Explain nondestructive testing.	6M	CO2	L4
b)	Explain the construction and working of sonogram.	6M	CO2	L5
	OR			
5. a)	What is acoustic absorption constant and what are the factors and remedies of an acoustically bad auditorium.	5M	CO2	L3

	b)	Explain a piezo electric method of ultrasonic wave production.	7M	CO2	L2

UNIT–III

6.	a)	Give the relation between dielectric susceptibility and dielectric constant and recommend a relation between dielectric polarisability and dielectric constant.	4M	CO3	L5
	b)	Classify the different types of magnetic materials with two properties of each.	8M	CO3	L4

OR

7.	a)	What is Orientational polarization. Graphically explain the frequency dependence of polarization on frequency of the applied AC signal and tabulate the three polarization mechanisms based on the frequency of their dominance.	8M	CO3	L2
	b)	Enumerate few applications of magnetic materials.	4M	CO3	L3

UNIT–IV

8.	a)	Explain the construction and working of He-Ne laser and what are the three wavelengths emitted by it.	8M	CO4	L3
	b)	Give the block diagram of an optical fiber communication system.	4M	CO4	L2

OR

9.	a)	Explain the construction and working of a semiconductor laser.	6M	CO4	L5
	b)	Enumerate any one medical applications of optical fibers and explain it.	6M	CO4	L2

UNIT–V

10.	a)	Analyze any one pressure sensor based on the principle and working.	6M	CO5	L4
	b)	Explain a sensor device used in Hall effect principle.	6M	CO5	L6

OR

11.	a)	What is magnetostriction sensor and explain.	6M	CO5	L4
	b)	Explain any two types of temperature sensors and compare the same.	6M	CO5	L5

*** End ***