



ARKA JAIN University, Jharkhand

1st Semester End Semester Examination – 2019-20

B.TECH

Subject: PPS
Branch –ALL
Time: 3 Hours

Full Marks: 70
Pass Marks: 28

- Candidates are required to give their answers in their own words as far as practicable.
- Question paper is divided into THREE PARTS - A ,B &C
- Part A is compulsory.
- Part B contains SIX questions out which FOUR are to be answered.
- Part C Contains SIX question out of which THREE are to be answered.

PART A

Q.1) All questions are compulsory.

A) Multiple choice Questions:

(10*1=10)

i) What will be the output of the following C code?

```
#include <stdio.h>

int main() {
    int i = 0;
    int x = i++, y = ++i;
    printf("%d %d\n", x, y);
    return 0;
}
```

- a) 0 2 b) 1 2
c) 0 1 d) 1 1

ii) For a 16 bit compiler the allowable range for int data type is

- a) -3.4e38 to 3.4e38 b) -32767 to 32768
c) -32768 to 32767 d) -32767 to 32767

iii) C language was developed at

- a) Sun Microsystems, 1990 b) Microsoft, 1980
c) AT&T's Bell Laboratory, 1972 d) none of them

iv) What will be the output of following program?

```
#include <stdio.h>

int main()
{
    int* ptr;
    *ptr = 5;
    printf("%d", *ptr);
    return 0;
}
```

}

a) compilation error

b) 5

c) Linking error

d) Runtime error

v) Which keyword can be used for coming out of recursion?

a) return

b) break

c) continue

d) exit

vi) Predict the output for:

```
#include <stdio.h>

int main()
{
    void two();
    printf("1 ");
    two();
}

void two()
{
    printf("2 ");
}
```

a) 121

b) 12

c) 1212

d) Error

vii) Which of the following is not a reserved word in C?

a) main

b) case

c) default

d) register

viii) If ASCII value of 'x' is 120, then what is the value of H if

$H = ('x' - 'w')/3;$

a) 3

b) 1

c) 2

d) 0

ix) Which among the following is NOT a logical or relational operator

a) !=

b) ==

c) ||

d) =

x) Operation "a = a * b + a" can also be written as _____

a) a *= b + 1;

b) (c = a * b) != (a = c + a);

c) a = (b + 1) * a;

d) All of the mentioned

B) Very Short Question

(5*2=10)

a) Differentiate between hardware and software?

- b) What is a pointer? Give example.
c) Give the output of the given expression when a= 7

$a+= a++ + ++a + --a + a--;$

- d) What are the basic input and output functions used in C?
e) What is an array? Name its types.

PART B

Q.2 Answer any four:

(4*5=20)

- i) What is a function? explain its classification.
ii) Differentiate between algorithm and flowchart with example.
iii) Write a program to display the use of pointer for swapping two numbers.
iv) Explain the components of CPU with a neat diagram.
v) Write a program to display any three string functions.
vi) What is recursion? Explain its working.

PART C

Answer any three:

(3*10=30)

- Q.3** What is an operator? Explain various types of operator. Write a program to display the use of ternary operator.
Q.4 Why do we need an array? Write a program to display matrix subtraction.
Q.5 Explain data types in C ? Why do we need them? differentiate between variable declaration and initialization.
Q.6 What is a loop? write down the syntax of each type of loop and draw their flowchart representation.
Q.7 Differentiate between call by value and call by reference in C? Write a program to display the factorial of a number using recursion.
Q.8 Write programs to display the sum of given series:
i) $S= 9+99+8+89+7+....$
ii) $S= x/1 + x/2 + x/3 +....$ up to n terms



ARKA JAIN University, Jharkhand

1st Semester End Semester Examination – 2019-20

Subject : mathematics-1

Time : 3 Hours

Course: B tech

Full Marks: 70

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- **Part-A** is compulsory.
- **Part- B** contains **SIX** questions out of which **FOUR** questions are to be answered.
- **Part- C** contains **SIX** questions out of which **THREE** questions are to be answered.
- **Part-D** is compulsory

PART A

Q1.) All questions are compulsory:-

A] Objective Answer Type

(5x1=5)

- i) The least upper bound of the sequence $\{\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots\}$ is
- 0
 - $\frac{1}{2}$
 - 1
 - none of these
- ii) $\int_0^{\pi/2} \cos^n x dx$
- $\frac{1}{n-1} I_{n-2}$
 - $\frac{1}{n-1} - I_{n-2}$
 - $\frac{1}{n-1} + I_{n-2}$
 - None of these
- iii) $D^n(x^n) = ?$
- x^n
 - nx^n
 - $n!$
 - None of these
- iv) $\lim_{n \rightarrow \infty} (x^n \log x) = ?$
- 0
 - 1
 - 2
 - None of these
- v) Series $a + ar + ar^2 + ar^3 + \dots$ of G.P is divergent if common ratio r is
- $r > 1$
 - $r < 1$
 - 1

d) None of these

B] Short Answer Type

(5x2=10)

- i) Define hermitian matrix?
- ii) Evaluate $\lim_{n \rightarrow 0} \frac{\log x}{\cot x}$?
- iii) if $I_n = \int_0^{\frac{\pi}{4}} \tan^n x dx$ then prove that $(n-1)(I_{n-1} + I_{n-2}) = 1$
- iv) Find y_n if $y = \cos(ax+b)$
- v) Define characteristic roots of square matrix A
- vi) Prove that the sequence whose nth term is $\frac{2n-7}{3n+2}$ tends to the limit $\frac{2}{3}$

PART B

Q2.) Answer any four:

(4x5=20)

- i) Prove that the sequence $\sqrt{2}\sqrt{2}, \sqrt{2}\sqrt{2}, \sqrt{2}\sqrt{2\sqrt{2}} \dots$ Converges to 2
- ii) Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ by echelon and normal matrix method?
- iii) if $u = \tan^{-1} \frac{x^3+y^3}{x-y}$, prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \sin 2u$
- iv) find the nth derivative of $y = \sin 2x \sin 3x$?
- v) test the convergency whose nth term is $\frac{2n}{1+n^2}$
- vi) Using lagranges mean value theorem find a point on the curve $y = x^2$ where the tangent is parallel to the line joining the points (1,1) and (2,2)

PART C

Answer any Three:

(3x10=30)

3) Find the area of the cardioids $r = a(1 - \cos \theta)$

Q4.) Find the volume formed by the revolution of the loop of the curve $y^2(a+x) = x^2(3a-x)$ about the x-axis?

Q5.) Find the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$

Q6.) the series $\frac{1}{1^p} + \frac{1}{2^p} + \frac{1}{3^p} \dots \dots \frac{1}{n^p} \dots$ is convergent if $p > 1$ and divergent if $p \leq 1$?

Q7.) prove that the Series $a + ar + ar^2 + ar^3 \dots$ of G.P is convergent only when common ratio $r < 1$

Q8.) Find the reduction formula of the $\int_0^{\frac{\pi}{2}} \sin^n x dx$

PART D

9) Evaluate $\int_0^{\frac{\pi}{2}} \log \cos x dx$

(5x1=5)



Subject : Engineering Physics

Time : 3 Hours

Course: B. Tech.

Full Marks: 70

Pass Marks: 28

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PART A

Q.1) All questions are compulsory

A] Multiple Choice Questions:

(10x1=10)

- 1) Polarization of light shows that light has
 - i. Wave nature
 - ii. Particle nature
 - iii. Transverse wave nature
 - iv. Longitudinal wave nature
- 2) The max KE of photo electron depends upon
 - i. intensity
 - ii. frequency
 - iii. wavelength
 - iv. energy
- 3) Lorentz transformation equations hold for
 - i. Non-relativistic velocities only
 - ii. Relativistic velocities only
 - iii. All velocities: relativistic & non-relativistic
 - iv. Photons only
- 4) Threshold frequency for a metal is 8×10^{14} Hz. Light of wavelength 5000 \AA falls on its surface. Which of the following statement is correct?
 - i. No photoelectric emission takes place
 - ii. Photoelectrons come out with zero speed.
 - iii. Photoelectrons come out with 10^3 m/s speed.
 - iv. Photoelectrons come out with 10^5 m/s speed.
- 5) difference (Φ) and path difference (δ) are related by $\Phi =$

i) $\frac{2\pi}{\lambda} \delta$

ii) $\frac{\delta}{2\pi}$

$$\text{iii) } \frac{\delta}{2\lambda}$$

$$\text{iv) } \frac{2\lambda}{\pi} \delta$$

- 6) In doubly refracting crystals along the optic axis
- $\mu_o > \mu_e$
 - $\mu_o = \mu_e$
 - $\mu_o < \mu_e$
 - $\mu_o > \mu_e^2$
- 7) What is the effect of intensity on the stopping potential?
- As intensity increases, stopping potential increases linearly
 - As intensity increases, stopping potential decreases linearly
 - As intensity decreases, stopping potential increases exponentially
 - No effect
- 8) The resolving power of a grating having N number of rulings exposed to the nth order is
- n/N
 - nN
 - N/n
 - N/n^2
- 9) The required condition to achieve laser action in a system is
- state of population inversion
 - existence of metastable state
 - a resonant cavity
 - all of the above
- 10) The magnitude of the E_x and E_y components are same in which type of polarization?
- Linear
 - Circular
 - Elliptical
 - Perpendicular

B] Very Short question

(5x2=10)

- Explain types of diffraction.
- Explain displacement current.
- State four properties of laser light.
- Derive De Broglie wave equation.
- What is population inversion?

PART B

Q2. Answer any four:

(4x5=20)

- State some applications of nanotechnology.
- State the postulates of special theory of relativity.
- Derive the integral form of Maxwell's first law & state its physical significance.
- Derive Brewster's law.
- An electron with a mass of 10^{-30} kg moves with a speed of about 7.5×10^5 m/sec. What is the de Broglie wavelength?

- vi. A 3 m long stick when it is at rest moves past an observer on the ground with a speed of $0.64c$. What is the length measured by the observer?

PART C

Answer any three:

(3x10=30)

- 1) What lead to the development of Lorentz transformation. Derive the direct & inverse Lorentz transformation equations.
- 2) Derive the expression for production of plane, elliptically & circularly polarized light.
- 3) (a) Explain the principle of production of laser light.
- 4) Derive Maxwell's fourth equation in differential form.
 - (a) Derive Einstein's photo electric equation.
 - (b) The work function of Na metal is $W=7.53 \times 10^{-19}$ J. If we shine light with a frequency of 3.0×10^{16} Hz on Na metal, will photoelectric effect be observed?
- 5) Derive the intensity at any point on the screen due to diffraction by a single slit.



ARKA JAIN University, Jharkhand

1st Semester Final Examination – 2019-20

Subject: Engineering Mechanics
Branch –All
Time:3Hours

Course: B.Tech.
Full Marks:70
Pass Marks: 28

- Candidates are required to give their answers in their own words as far as practicable.
- Question paper is divided in to **Three Parts-A, B & C.**
- **Part -A** is compulsory.
- **Part- B** contains **SIX** question out which **FOUR** are to be Answered.
- **Part- C** Contains **SIX** question out of which **THREE** is to be Answered.

PART A

Q1)[A]Multiple Choice Questions

(10x1=10)

i) When two forces P and Q act at right angles the resultant is

a) $\sqrt{P^2 + Q^2}$

b) $\sqrt{P^2 - Q^2}$

c) \sqrt{PQ}

d) $\sqrt{P + Q}$

ii) If a number of coplanar forces are acting simultaneously on a particle , the algebraic sum of the moments of all the forces about any point is equal to the moment of their resultant. This principle is known as

a)principle of moments

b)principle of levers

c)principle of conservation of energy

d) none

iii) If the sum of all forces acting on a body is zero, the body may be in equilibrium provided the forces are

a) concurrent

b)parallel

c) like parallel

d) unlike parallel

iv) The moment of inertia of a circular section of diameter d about the x-x axis passing through centre of gravity is

a) $\frac{\pi}{64} d^4$

b) $\frac{\pi}{32} d^4$

c) $\frac{\pi}{16} d^4$

d) $\frac{\pi}{96} d^4$

v) For a perfect frame which one of the following correlation exists between the number of joints j and number of members n

a) $n=2j-3$

b) $n=2j+3$

c) $n=\frac{2}{3}j$

d) None

vi) Effort required at mean radius of a screw jack to raise a load w is given by

a) $P=W\tan(\alpha+\phi)$

b) $p=W\tan(\alpha-\phi)$

c) $p=W\tan\left(\frac{\alpha}{\phi}\right)$

d) None

vii) If the system is in equilibrium then the algebraic sum of virtual work for every virtual displacement is

a) zero

b) positive

c) negative

d) none

viii) The moment of inertia of a rectangular lamina of base b and height h about an axis passing through the centre of gravity and parallel to the base is

a) $\frac{bh^3}{12}$

b) $\frac{bh^3}{24}$

c) $\frac{bh^3}{36}$

d) $\frac{bh^3}{48}$

ix) The numerical ratio of displacement to distance may be

a) greater than 1

b) equal to 1

c) less than 1

d) none

x) Couple Moment is

a) Fixed Vector

b) Free Vector

c) Both a and b

d) None of the above

B) Very short question

(5x2=10)

- c) State and Explain parallel axis theorem for moment of inertia.
- d) State Lami's theorem
- d) If $a = 2i + 2j + 2k$ & $b = i + 2j + k$, then find the angle between $(a+b)$ and $(a-b)$.
- d) Define Work, Power & Energy ?
- e) Explain Coulomb's Law of Dry Friction ?

PART B

Q.2) Answer any Four Question

(4x5=20)

- i) Define Law of Conservation of Momentum.
- ii) To find the Moment of Inertia of Rectangular Section.
- iii) Define and Explain Centroid and Centre of Gravity.
- iii) State & Explain Varignon's Theorem .
- iv) State and Explain the Virtual work
- v) Two forces act at an angle of 120° . The bigger force is 40N and the resultant is perpendicular to the smaller one. Find the smaller force.
- vi) What is Free Body Diagram and Draw the FBD of A block resting on a smooth table.

PART C

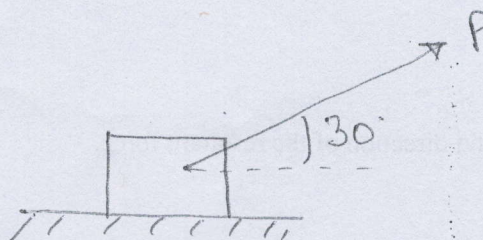
Answer any Three Question

(3x10=30)

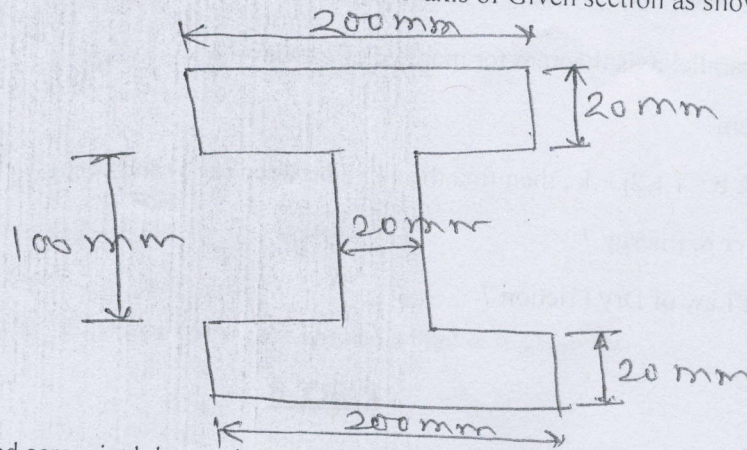
Q.3) A Block of 10kg mass resting on a rough horizontal plane is pulled by an inclined force P at a constant velocity over a distance of 5 m . The coefficient of Kinetic Friction between the contact plane is 0.2. Sketch the FBD of the block showing all the forces acting on it.

Also determine

- i) The work done by each force acting on the free body, &
- ii) The work done on the block.



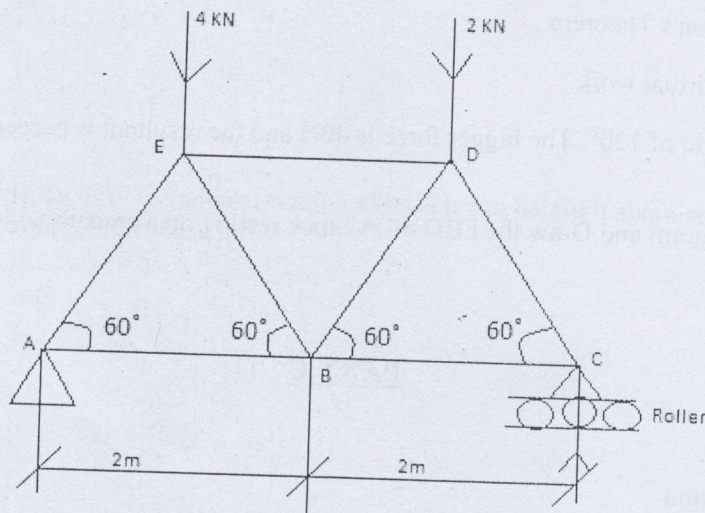
Q.4) To Find the Moment of Inertia about X-X and Y-Y axis of Given section as shown in figure:-



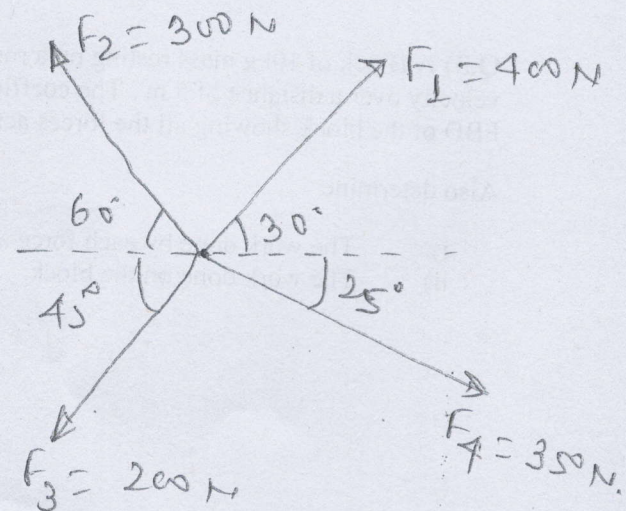
Q.5) A single threaded screw jack has a pitch of 12mm and a mean diameter of 75mm . The coefficient of static friction between the screw and Nut is 0.2 and that of the kinetic friction is 0.1. Determine the force P to be applied at the end of a 500 mm long lever

- i) To just lift the weight of 25kN, &
- ii) To keep the screw jack turning.

Q.6) Determine the reaction and the forces in each member of a simple triangular truss using method of joints.



Q.7) The forces act at a point as shown in figure:-



Find the magnitude and direction of the resultant force.

- Q.8) Find the Moment of a 100 N Force acting between point A and B as shown in fig
- i) about the origin
 - ii) about point C
 - iii) about axis CD

