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**m<uq jdr mÍCIKh - 2020**

**First Term Examination - 2020**

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**COMBINED MATHS – I**

**Answer all the questions of Part A and any five question of Part B**

**Part - A**

01. Find the domain and the range of the function **f =**

02. Solve the equation,

03. Solve the equation,

04. Solve the inequality , for **X R**

05. The coordinates of points **A, B** and **C** are **(3 , 4) , (4 , -1)** and **(-2 , -3)** respectively. The unit vectors along **OX**  and **OY** axis are  and

i. Express the vector , form.

ii. Find the unit vector along

45o

Q

P = N

O

R

06. Three forces **P , Q** and **R** act on a particle **O**. If **P** **= .** If the particle is in equilibrium then find the value of **Q** and **R**

07. A particle falls from rest freely from the top of a tower and during the last second of its motion it falls th of the whole height. Find the height of the tower. **(g = 10 ms-2)**

08. Two particles **P** and **Q** move along a straight line **AB**, starting from **A**. **P** moves with a velocity **U** and acceleration **f** , **Q** with velocity **U1** and acceleration **f1**. If the both have the same velocity at the middle point of **AB**, then prove that

**AB =**

**Part - B**

09. (a). The roots of the are and . Find **P** if,

i. = ii. - = 2

(b). Let **f =**

**(*x* - 1)** is a factor of **f**  and **f** is divided by ***x*2 + 3x + 2** , the remainder is **-15 x – 10** . Find the values of **a, b** and **c**

(c). Express in partial fractions

10. (a). Find the limits of the following.

lim

*x* 4

lim

*x* 1

1. ii.

lim

*x*

lim

*x* 0

1. iv.

lim

*x* a

(b). If = 9, find all the possible values of *a*.

11. (a). Prove the following statements,

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¸¸'

¸¸¸'

(b). If, and then prove that,

12. (a). State the Lami’s Theorem.

A point **A** on a sphere of radius a, weight **W** and centre **O**, rests contact with a smooth vertical wall and is supported by a string of length **2*a***, Joining a point **B** on the sphere to a point **C** on the wall. If the sphere is in equilibrium find,

i. The tension in the string,

ii. The reaction at **A**, in terms of **W**.

(b). A smooth hemispherical bowl of internal radius , is fixed with its rim horizontal. A thin uniform rod of length and weight rests with one end inside the bowl and other projecting over the rim. If the rod is inclined at an angle to the horizontal. If the system is in equilibrium.

i. Find the reactions between the rod and the bowl in terms of and **W**.

ii. Show that,

13. (a). Position vectors of the points , and are , and respectively with respect to the origin **O**. **P** is a point on **BC** such that **PC = 2 BP** and **Q** is a point on the extended line **AP** such that **AQ = 3 AP**. Determine the position vectors **P** and **Q** in terms of  **,**  and .

Also show that and are two parallel vectors.

(b). State the scalar product of the two vectors and .

The resultant of two vectors and is perpendicular to . If then show that the resultant of and is perpendicular to

(c). Forces of magnitude , , and acts along , , and respectively of a square **ABCD** of side ***a***.

Find,

i. The resultant of the system of forces.

ii. The distance from **D**, where the line of action of the resultant cuts **CD**.

14. (a). A bullet fired into a target losses half of the velocity, after penetrating **3 cm**. Find the distance that it will further penetrate before coming to rest.

(b). The speed of a train increases at a constant rate **f1** from rest to **V**, then remains constant for and interval and finally decreases to rest at a constant rate **f**. If **S** is the total distance travelled **2** sketch the **v-t** graph for the motion of the train. Show that total time taken to the journey is,  **+**