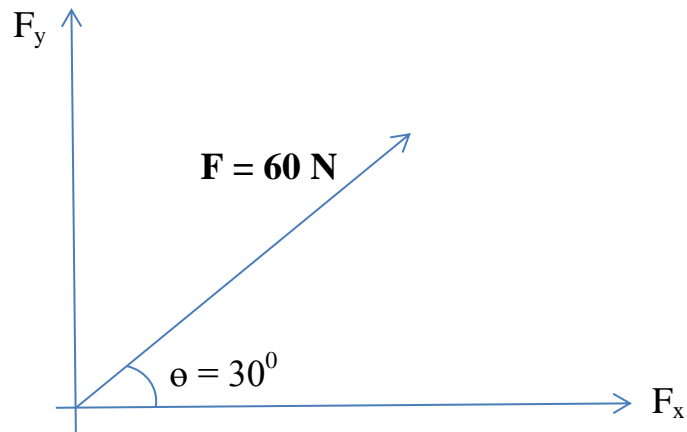**SECTION (10 MARKS)**

1.   The followings are base quantities unit **EXCEPT**

      A. kilogram

      B. newton

      C. metre

      D. Kelvin

2.

F_y

F = 60 N

$\theta = 30^0$

F_x

Figure 1

Referring to Figure 1, calculate the effective force along the x-axis.

A. 30.00 N

B. 40.20 N

C. 51,96 N

D. 92.37 N

3.   The Newton's third law states that when a contact force is exerted on one object by
      another, the second object exerts an _____ and opposite force on the first object.

      A. different

      B. parallel

      C. equal

      D. opposite

4.   _____ is a form of energy that flows from hotter region to colder region.

A. Temperature

B. Heat

C. Friction

D. Pressure

5. _____ is the unit for absolute temperature.

    A. Kelvin

    B. Celcius

    C. Fahrenheit

    D. Candela

6. Figure 2 shows one application where pressure is transmitted equally through a liquid. The principle that governs the transfer of force from *effort to load* is
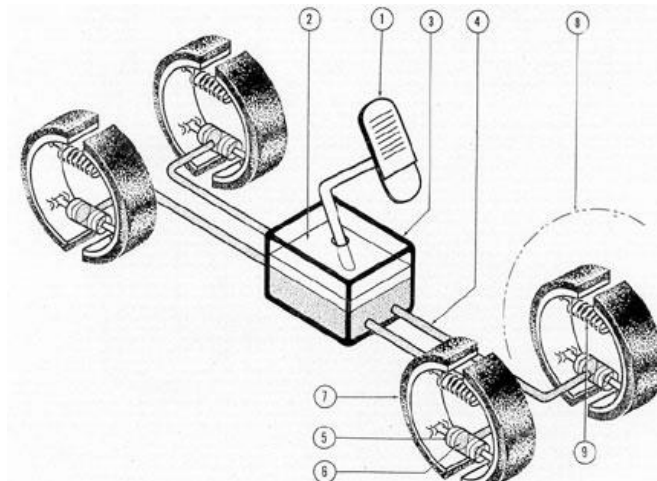
Figure 2: brake hydraulic system

    A. Phillip's principle

    B. Pascal's principle

    C. Victoria principle

    D. Dublin's principle

7. The mechanical advantage of a machine is the ratio of the load to the _____.

    A. distance.

    B. friction.

    C. resistance.

    D. effort.

8.   Torque is the product of force and _____ distance from the centre of rotation.

      A.   force and parallel distance

      B.   force and straight distance

      C.   force and perpendicular distance

      D.   force and curved distance

9.   The calculated engine power of an engine is also known as _____.

      A.   the engine power

      B.   the brake power

      C.   the torque power

      D.   the indicated power

10.   Indicated power (*IP*) is the power that is developed _____.

      A.   inside the engine cylinders

      B.   outside the engine cylinders

      C.   along the engine cylinders

      D.   under the engine cylinders

11.   Power is defined as the rate of doing work, i.e. Power = _____.

      A.   work done/ time taken

      B.   time taken/ work done

      C.   pressure/ cross-sectional area

      D.   force/ time taken

12.   Which of the following can be **totally** compressed?

      A. Solids

      B. Liquids

      C. Gas

      D. Plasma

13.   In materials, there are three basic type of stress **EXCEPT** _____.

      A. tensile stress.

      B. compressive stress

      C. shear stress.

      D. strain stress.

14.   Simple harmonic motion equation is described by

      A. $a = -\omega^2 x^2$

      B. $a = -\omega x$

      C. $a = -\omega^2 x$

      D. $a = -\omega x^2$

15.   A barometer is an instrument used to measure _____.

      A. direct current

      B. relative density

      C. absolute temperature

      D. atmospheric pressure

16.   A steel tie rod used in a suspension system has a diameter of 0.015 m.
      Determine the tensile stress in the tie rod when a tensile force of 600 N is
      applied to it under braking.

      A. 0.4×10^6 N/m^2

      B. 2.4×10^6 N/m^2

      C. 3.4×10^6 N/m^2

      D. 10.4×10^6 N/m^2

17. 4 m^3 of gas at 323 K are heated at constant pressure until the volume is tripled.
      Determine the final temperature of the gas.

      A. 323 K

      B. 646 K

      C. 717 K

      D. 969 K

18.   Young's modulus, E is defined as

A. stress x strain

B. tensile stress/ tensile strain

C. sagging x hogging

D. sagging/ hogging

19.   Figure 3 shows a simple hydraulic system. A_1 and A_2 are cross sectional area of the piston. Given areas $A_1 = 5$ m^2 and $A_2 = 25$ m^2. The minimum force F_1 required to lift a load of 1300 kg is:
(You may use g = 10 m/s^2)
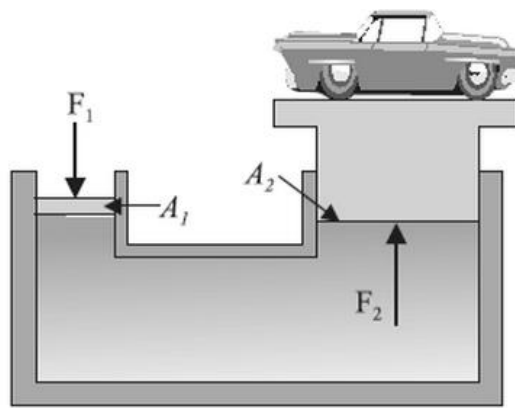
Figure 3. A hydraulic jack system

A.   500 N

B.   600 kg

C.   2600 N

D.   3400 kg

20.   Archimedes' principle relates buoyancy to displacement. It states that any object, wholly or partially immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object. State the reason why a steel ship floats at sea, even though steel is denser than sea water.

A.   The steel ship floats because it displaces bigger volume of sea water compared to its own volume.

B.   The steel ship floats because the propellers spin quickly enough.

C.   The steel ship floats because sea water could not flow into its compartment.

D.   The steel ship floats because its surface area is greater than the area of sea water displaced..