Federal University of Technology, Minna.

Department of Industrial and Technology Education

Session: 2017/2018 Second Semester Examination
Course Title: Automotive Science & Calculation.
Course Code: ITE 327
Time Allowed: 2 Hours
Instruction: Attempt four (4) Questions Only

1a. State the first law of motion and explain where it is applicable

1b. A retarding force of 8KN acts on a vehicle of mass 2 tonnes which is moving at 75 Km/hr. Calculate:
(i) Stopping distance
(ii) Brake efficiency (Take g as $10m/s^2$)

2a. Define Modulus of Elasticity

2b. A steel towering bar is 70mm diameter and 5.8m long. Calculate the stress in the bar when pulling a load of 250KN. If the Young's Modulus of Elasticity for the material is $200GN/m^2$, calculate the increase in length when pulling the load.

3a. An engine running under full load conditions develops its maximum torque at 1500 rev/min when the engine power is 1800 w. Find:
(i) Torque transmitted by the clutch
(ii) Maximum capacity of the clutch if the safety factor is 1.4

3b. A single plate clutch is required to transmit a maximum torque of 118N/m. The friction rings are 250mm external diameter, 127mm internal diameter and the coefficient of friction is 0.35. What force must be exerted by each of the seven springs?

4a. A cast iron column of hollow cross-section has an outside diameter 155mm and is used to support a load of 85KN. If the average compressive stress produced in the metal is $8.16 N/mm^2$. Calculate the inside diameter of the column.

4b. A car moving with an initial velocity of 40m/s accelerates uniformly at the rate $15m/s^2$ until it attains a velocity of 60m/s. What is the distance covered during this period?

5a. If the force on the handbrake lever is 380N and is applied at distance of 0.5m from the fulcrum, the diameter of the brake rod being 8mm and attached to a point on the lever is 0.07m from the fulcrum. Calculate the stress in the rod in Kilo Newton/Metre Square.

5b. The maximum pressure on an engine piston 80mm diameter is $3.5N/mm^2$. The hollow gudgeon pin is 24mm outside diameter and 12mm inside diameter. Calculate:
(i) The maximum force on the piston and gudgeon pin
(ii) The shear stress in the material of the gudgeon pin