

Paper-IV
GENERAL ENGINEERING SCIENCE
SECTION-II

Time Allowed : 2 Hours

(Subjective)

Maximum Marks : 100

- Note : (i) Attempt only five questions.
(ii) All questions carry equal marks.
(iii) All parts of a question must be answered together.

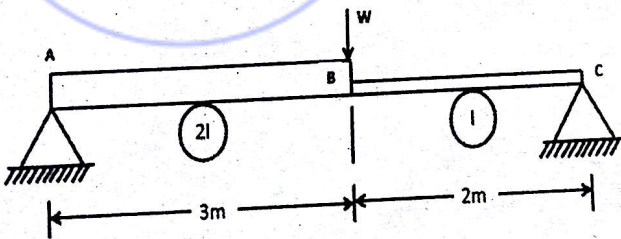
1. A golfer hits a golf ball, imparting to it all initial velocity of 60 m/s directed at 30° above the horizontal. Assuming that the mass of the ball is 0.025 kg and the club and ball are in contact for 0.01 & find :

- i. the impulse imparted to the ball,
- ii. the average force exerted on the ball by the club, and
- iii. the work done on the ball.

2. Two impedances $Z_1 = 10 + j5 \Omega$ and $Z_2 = 8 + j6$ are jointed in parallel and connected across a voltage of $V = 200 + j0$. Calculate the circuit current, its phase and branch currents.

3. Calculate the diameter of a solid circular shaft which is required to transmit power of 160 kW at 1450 rpm, if the shear stress in the shaft is not to exceed $50 \times 10^6 \text{ N/m}^2$. What is the energystored in the shaft per meter of its length (Give : $G = 8 \times 10^{10} \text{ N/m}^2$).

4. Calculate the slope at support 'A' and vertical deflection at point 'B' in terms of 'EI' for the beam 'ABC' shown in figure, given below. The moment of inertia in beam 'AB' is 2I and in beam 'BC', it is I.



5. (a) Enumerate various raw materials for the manufacture of Port – Land cement.
(b) Discuss in brief the dry and wet processes of manufacture of Port – Land cement.
(c) Write short notes on Setting and Hardening of Port Land Cement.
6. (a) Differentiate between Impulse and Reaction Turbine.

(b) An flow Francis Turbine runs at 450 rpm, discharging 15 m^3 of water per second. The velocity and pressure head at the entrance of the runner are 10 m/s and 230 m respectively. The elevation above the tail race is 5 m. The diameter of the runner is 2 m and inlet width is 0.25 m. The hydraulic and-over-all efficiencies are 95% and 90% respectively. Find out

- i. the power output
- ii. the guide vane angle and
- iii. the rotor vane angle at inlet.

7. The temperature of a black surface of area 0.3 m^2 is 627°C . Calculate

- i. the total rate of energy emission.
- ii. the intensity of normal radiation and
- iii. the wave length of maximum monochromatic emission power. Assume Stefan. Boltzmann constant as $\sigma = 56.7 \times 10^{-12} \text{ kW/m}^2 \text{ K}^4$ and Weins Law constant as 0.0029 mK.

8. In a steam power plant operating with simple Rankine Cycle, the turbine is fed steam at 100 bar and 673K. Determine the actual enthalpy and quality of steam extracted at 14 bar, if the turbine stage efficiency is 90% (Assume isentropic expansion).

Given

- i. at 100 bar and 673K: $h_f = 3097 \text{ kJ/kg}$; $s_f = 6.218 \text{ kJ/kg K}$
- ii. at 14 bar : $h_1 = 830 \text{ kJ/kg}$; $s_f = 2.284 \text{ kJ/kg K}$
 $h_g = 2790 \text{ kJ/kg}$; $s_g = 6.469 \text{ kJ/kg K}$

9. Given full form of PERT and CPM Differentiate also between PERT and CPM stating their applications, advantages & limitation.

10. (a) What are the ill effects of various pollutions on Human Health.

(b) Write short notes on

- i. Solid Waste Shredders
- ii. Compactors and
- iii. Incinerators of waste handling methods.