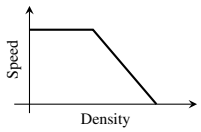
2018-CE-'14-26'

EE24BTECH11023

1) A bitumen sample has been graded as VG30 as per IS: 73-2013. The '30' in the grade means that
   a) penetration of bitumen at $25°C$ is between 20 and 40
   b) viscosity of bitumen at $60°C$ is between 2400 and 3600 Poise
   c) ductility of bitumen at $60°C$ is more than 30 cm
   d) elastic recovery of bitumen at $60°C$ is more than 30%
2) The speed-density relationship for a road section is shown in the figure.



   The shape of the flow-density relationship is
   a) piecewise linear
   b) parabolic
   c) initially linear then parabolic
   d) initially parabolic then linear
3) A well-designed signalized intersection is one in which the
   a) crossing conflicts are increased
   b) total delay is minimized
   c) cycle time is equal to the sum of red and green times in all phases
   d) cycle time is equal to the sum of red and yellow times in all phases
4) A flow field is given by $u = y^2$, $v = -xy$, $w = 0$. Value of the z-component of the angular velocity (in radians per unit time, up to two decimal places) at the point (0, -1, 1) is _____
5) The frequency distribution of the compressive strength of 20 concrete cube specimens is given in the table.

f (MPa)	Number of specimens with compressive strength equal to f
23	4
28	2
22.5	5
31	5
29	4

   If μ is the mean strength of the specimens and σ is the standard deviation, the number of specimens (out of 20) with compressive strength less than $\mu - 3\sigma$ is _____
6) In a fillet weld, the direct shear stress and bending tensile stress are 50 MPa and 150 MPa, respectively. As per IS 800:2007, the equivalent stress (in MPa, up to two decimal places) will be _____
7) In a shrinkage limit test, the volume and mass of a dry soil pat are found to be 50 cm^3 and 88 g, respectively. The specific gravity of the soil solids is 2.71, and the density of water is 1 g/cc. The shrinkage limit (in %, up to two decimal places) is _____
8) A core cutter of 130 mm height has inner and outer diameters of 100 mm and 106 mm, respectively. The area ratio of the core cutter (in %, up to two decimal places) is _____

9) A 1:50 model of a spillway is to be tested in the laboratory. The discharge in the prototype spillway is 1000 m^3/s. The corresponding discharge (in m^3/s, up to two decimal places) to be maintained in the model, neglecting variation in acceleration due to gravity, is _____

10) A 10 m wide rectangular channel carries a discharge of 20 m^3/s under critical condition. Using $g = 9.81\ m/s^2$, the specific energy (in m, up to two decimal places) is _____

11) For routing of flood in a given channel using the Muskingum method, two of the routing coefficients are estimated as $C_0 = -0.25$ and $C_1 = 0.55$. The value of the third coefficient C_2 would be _____

12) A city generates 40×10^6 kg of municipal solid waste (MSW) per year, out of which only 10% is recovered/recycled and the rest goes to landfill. The landfill has a single lift of 3 m height and is compacted to a density of 550 kg/m^3. If 80% of the landfill is assumed to be MSW, the landfill area (in m^2, up to one decimal place) required would be _____

Q.26-Q.55 Carry two marks each

13) The value of the integral $\int_0^{\pi} x\cos^2 x\,dx$ is

a) $\frac{\pi^2}{8}$ b) $\frac{\pi^2}{4}$ c) $\frac{\pi^2}{2}$ d) π^2