’2023-CE-’27-39’

EE24BTECH11007 - Arnav Makarand Yadnopavit

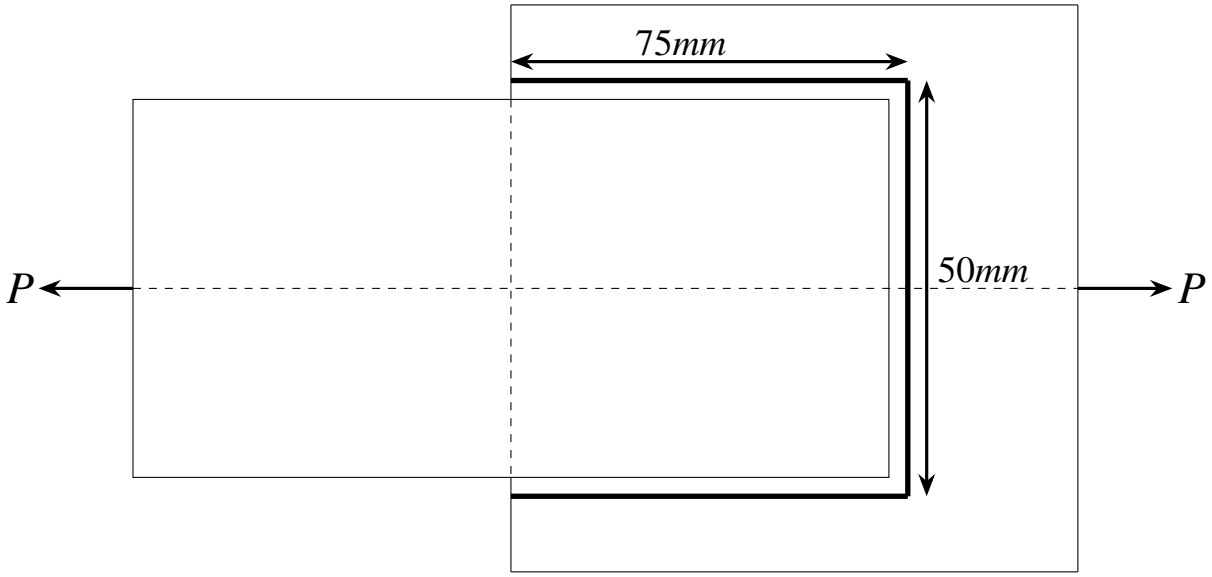
27) Identify the waterborne diseases caused by viral pathogens:
   a) Acute anterior poliomyelitis
   b) Cholera
   c) Infectious hepatitis
   d) Typhoid fever

28) Which of the following statements is/are TRUE for the Refuse-Derived Fuel (RDF) in the context of Municipal Solid Waste (MSW) management?
   a) Higher Heating Value (HHV) of the unprocessed MSW is higher than the HHV of RDF processed from the same MSW
   b) RDF can be made in the powdered form
   c) Inorganic fraction of MSW is mostly converted to RDF
   d) RDF cannot be used in conjunction with oil

29) The probabilities of occurrences of two independent events A and B are 0.5 and 0.8, respectively. What is the probability of occurrence of at least A or B (rounded off to one decimal place)?_____

30) In the differential equation $\frac{dy}{dx} + \alpha xy = 0$, α is a positive constant. If $y = 1.0$ at $x = 0.0$, and $y = 0.8$ at $x = 1.0$, the value of α is _____(rounded off to three decimal places).

31) Consider the fillet-welded lap joint shown in the figure (not to scale). The length of the weld shown is the effective length. The welded surfaces meet at right angle. The weld size is $8mm$, and the permissible stress in the weld is $120MPa$. What is the safe load P (in kN, rounded off to one decimal place) that can be transmitted by this welded joint?



32) A drained direct shear test was carried out on a sandy soil. Under a normal stress of $50kPa$, the test specimen failed at a shear stress of $35kPa$. The angle of internal friction of the sample is _____ degree (round off to the nearest integer).

33) A canal supplies water to an area growing wheat over 100 hectares. The duration between the first and last watering is 120 days, and the total depth of water required by the crop is $35cm$. The most intense watering is required over a period of 30 days and requires a total depth of water equal to

$12cm$. Assuming precipitation to be negligible and neglecting all losses, the minimum discharge (in m^3/s, rounded off to three decimal places) in the canal to satisfy the crop requirement is _____.

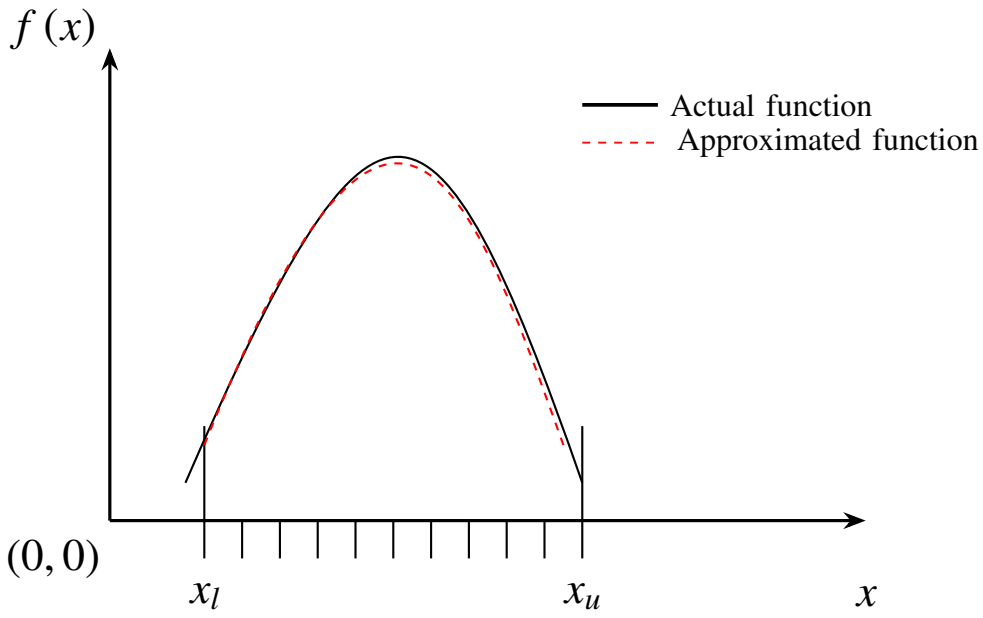
34) The ordinates of a one-hour unit hydrograph for a catchment are given below:

t (hour)	0	1	2	3	4	5	6	7
$Q\left(m^3/s\right)$	0	9	21	18	12	5	2	0

Using the principle of superposition, a D-hour unit hydrograph for the catchment was derived from this one-hour unit hydrograph. The ordinates of the D-hour unit hydrograph were obtained as $3m^3/s$ at t=1 hour and $10m^3/s$ at t=2 hour. The value of D (in integer) is _____.

35) For a horizontal curve, the radius of a circular curve is obtained as $300m$ with the design speed as $15m/s$. If the allowable jerk is $0.75m/s^3$, what is the minimum length (in m, in integer) of the transition curve?_____

36) A function $f(x)$, that is smooth and convex-shaped between interval (x_l, x_u) is shown in the figure. This function is observed at odd number of regularly spaced points. If the area under the function is computed numerically, then _____.

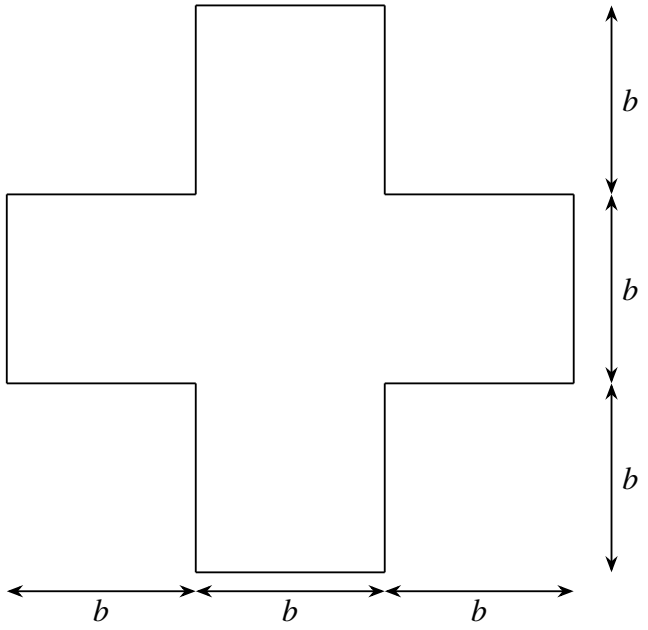


a) the numerical value of the area obtained using the trapezoidal rule will be less than the actual
b) the numerical value of the area obtained using the trapezoidal rule will be more than the actual
c) the numerical value of the area obtained using the trapezoidal rule will be exactly equal to the actual
d) with the given details, the numerical value of area cannot be obtained using trapezoidal rule

37) Consider a doubly reinforced RCC beam with the option of using either Fe250 plain bars or Fe500 deformed bars in the compression zone. The modulus of elasticity of steel is $2\times10^5 N/mm^2$. As per IS456:2000, in which type(s) of the bars, the stress in the compression steel (f_{sc})can reach the design strength $\left(0.87f_y\right)$ at the limit state of collapse?

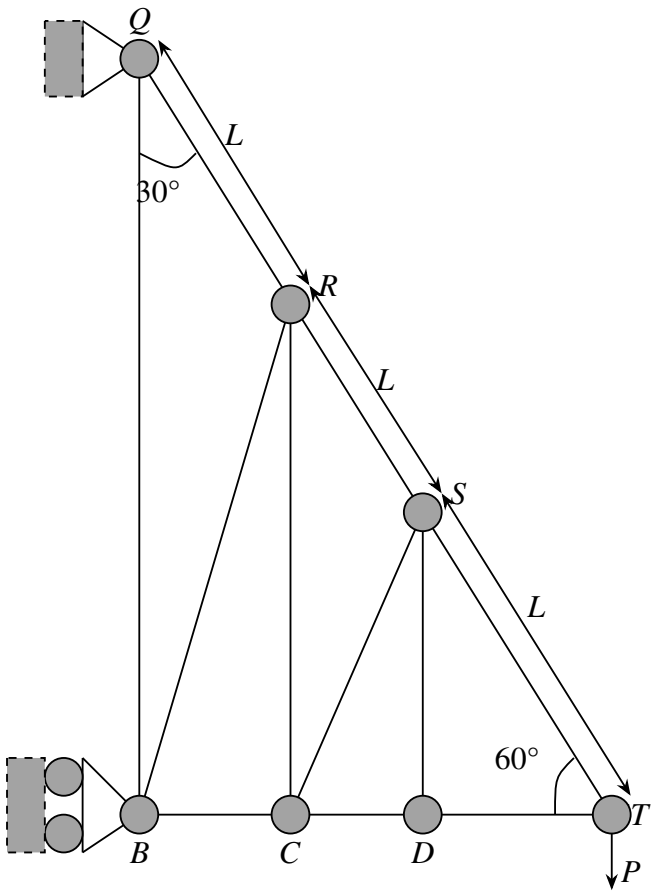
a) Fe250 plain bars only
b) Fe500 deformed bars only
c) Both Fe250 plain bars and Fe500 deformed bars
d) Neither Fe250 plain bars nor Fe500 deformed bars

38) Consider the horizontal axis passing through the centroid of the steel beam cross-section shown in the figure. What is the shape factor (rounded off to one decimal place) for the cross-section?



a) 1.5 b) 1.7 c) 1.3 d) 2.0

39) Consider the pin-jointed truss shown in the figure (not to scale). All members have the same axial rigidity, AE. Members QR, RS, and ST have the same length L. Angles QBT, RCT, SDT are all 90°. Angles BQT, CRT, DST are all 30°. The joint T carries a vertical load P. The vertical deflection of joint T is $k\frac{PL}{AE}$. What is the value of k



a) 1.5 b) 4.5 c) 3.0 d) 9.0