JELET-2021

For Diploma in Engg. & Tech. Candidates

1091007537

(Booklet Number)

Duration: **2** Hours

Full Marks: **100**

INSTRUCTIONS

1. All questions are of objective type having four answer options for each. Only one option is correct. Correct answer will carry full marks 1. In case of incorrect answer or any combination of more than one answer, ¼ marks will be deducted.
2. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C, or D.
3. Use only **Black/Blue ball point pen** to mark the answer by complete filling up of the respective bubbles.
4. Mark the answers only in the space provided. Do not make any stray mark on the **OMR**.
5. Write question booklet number and your roll number carefully in the specified locations of the OMR. Also fill appropriate bubbles.
6. Write your name (in block letter), name of the examination centre and put your full signature in appropriate boxes in the OMR.
7. The OMR is liable to become invalid if there is any mistake in filling the correct bubbles for question booklet number/roll number or if there is any discrepancy in the name/ signature of the candidate, name of the examination centre. The OMR may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be sole responsibility of candidate.
8. Candidates are not allowed to carry any written or printed material, calculator, pen, docupen, log table, wristwatch, any communication device like mobile phones etc. inside the examination hall. Any candidate found with such items will be **reported against** and his/her candidature will be summarily cancelled.
9. Rough work must be done on the question paper itself. Additional blank pages are given in the question paper for rough work.
10. Hand over the OMR to the invigilator before leaving the Examination Hall.

SPACE FOR ROUGH WORK

JELET-2021

Question 1 to 70 for all candidates
Mathematics

1. For each real x such that $-1 < x < 1$, let $A(x) = (1-x)^{-1/2}\begin{pmatrix} 1 & -x \\ -x & 1 \end{pmatrix}$, then

$A(x).A(y) = \sqrt{1+xy}\, A(t)$, where $t =$

(A) $\frac{x-y}{1-xy}$ (B) $\frac{x+y}{1+xy}$

(C) $\frac{x-y}{1+xy}$ (D) $\frac{x+y}{1-xy}$

2. Let $C_k = {}^nC_k$ for $0 \le k \le n$ and $A_k = \begin{pmatrix} C_{k-1} & 0 \\ 0 & C_k \end{pmatrix}$ for $k \ge 1$.

If $A_1A_2 + A_2A_3 + \ldots\ldots A_{n-1}A_n = \begin{pmatrix} k_1 & 0 \\ 0 & k_2 \end{pmatrix}$, then $k_1 = k_2 =$

(A) ${}^{2n}C_n$ (B) ${}^{2n}C_{n-1}$

(C) ${}^nC_{n-1}$ (D) ${}^nC_{n+1}$

3. $\Delta = \begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & \cos\beta \end{vmatrix}$ is

(A) independent of α (B) independent of β

(C) independent of α and β (D) dependent on both α and β

4. If $s = a + b + c$, then the value of $\begin{vmatrix} s+c & a & b \\ c & s+a & b \\ c & a & s+b \end{vmatrix}$ is

(A) $2s^2$ (B) $2s^3$

(C) s^3 (D) $3s^3$

5. If $\hat{i}, \hat{j}, \hat{k}$ are unit vectors along the positive directions of X, Y and Z axes respectively, then which one is **not** true ?

(A) $\sum \hat{i}.(\hat{j}+\hat{k}) = 0$ (B) $\sum \hat{i}.(\hat{j}\times\hat{k}) = 0$

(C) $\sum \hat{i}\times(\hat{j}\times\hat{k}) = \vec{0}$ (D) $\sum \hat{i}\times(\hat{j}+\hat{k}) = \vec{0}$

6. The points D, E, F divide BC, CA, AB of ΔABC in the ratio 1:4, 3:2 and 3:7 respectively and the point K divides AB in the ratio 1:3.

If $\overrightarrow{R_1} = \overrightarrow{AD} + \overrightarrow{BE} + \overrightarrow{CF}$ and $\overrightarrow{R_2} = \overrightarrow{CK}$, then

(A) $\overrightarrow{R_1} = \overrightarrow{R_2}$ (B) $5\overrightarrow{R_1} = 2\overrightarrow{R_2}$

(C) $2\overrightarrow{R_1} = 5\overrightarrow{R_2}$ (D) $3\overrightarrow{R_1} = 4\overrightarrow{R_2}$

7. The function e^x is tabulated at intervals of length 0.01 from 0 to 1. The maximum error of linear interpolation is

(A) 3.4×10^{-5} (B) 3.4×10^{-6}

(C) 3.4×10^{-7} (D) 3.4×10^{-8}

8. If the formula $\int_{-1}^{1} f(x)dx = A_0 f\left(-\frac{1}{2}\right) + A_1 f(0) + A_2 f\left(\frac{1}{2}\right)$ is exact for polynomials of maximum degree 2, then the values of the constants A_0, A_1, A_2 are respectively

(A) $\frac{4}{3}, -\frac{2}{3}, \frac{4}{3}$ (B) $\frac{4}{3}, \frac{2}{3}, -\frac{4}{3}$

(C) $-\frac{1}{4}, \frac{2}{3}, \frac{4}{3}$ (D) $\frac{4}{3}, \frac{2}{3}, \frac{4}{3}$

9. In the bisection method of finding approximate root of an equation $f(x) = 0$ lying in the small interval [a, b], the error in the n^{th} step is less than

(A) $\frac{1}{2^n}$ (B) $\frac{1}{|a^n - b^n|}$

(C) $\frac{2^n}{b-a}$ (D) $\frac{b-a}{2^n}$

10. For which of the following function $f(x)$, the value of $\int_{2}^{5} f(x)dx$ will be exactly given by Trapezoidal rule ?

(A) $f(x) = x^3$ (B) $f(x) = 2x^2 + 9$

(C) $f(x) = x^5 + 2x^2$ (D) $f(x) = 90x + 90$

11. If $z = ln(\tan x + \tan y)$, then $\sin 2x \frac{\partial z}{\partial x} + \sin 2y \frac{\partial z}{\partial y} =$

(A) 1 (B) 2

(C) 3 (D) 4

12. If z is a function of x and y and $x^x.y^y.z^z = 1$, then $\frac{\partial z}{\partial x} =$

(A) $\frac{1 + lnx}{1 + lnz}$ (B) $-\frac{1 + lnx}{1 + lnz}$

(C) $-\frac{1 + lnz}{1 + lnx}$ (D) $\frac{1 + lnz}{1 + lnx}$

13. If $u = \frac{x}{a} + f(ay - bx)$; then $a\frac{\partial u}{\partial x} + b\frac{\partial u}{\partial y} =$

(A) a (B) b

(C) $\frac{a}{b}$ (D) 1

14. If $y(x)$ be a solution of $\frac{d}{dx}\left(x\frac{dy}{dx}\right)=x$, $y(1)=0$, $y'(1)=0$, then $y(2)=$

(A) $\frac{3}{4}+\frac{1}{2}\log_e 2$ (B) $\frac{3}{4}-\frac{1}{2}\log_e 2$

(C) $\frac{3}{4}+\log_e 2$ (D) $\frac{3}{4}-\log_e 2$

15. $z=\sin x$ transforms the differential equation $\frac{d^2y}{dx^2}+\tan x\frac{dy}{dx}+y\cos^2 x=0$ in to

(A) $\frac{d^2y}{dz^2}+y=0$ (B) $\frac{d^2y}{dz^2}-y=0$

(C) $\frac{d^2y}{dz^2}+4y=0$ (D) $\frac{d^2y}{dz^2}-4y=0$

16. The solution of the differential equation $\left(1+y^2\right)+\left(x-e^{\tan^{-1}y}\right)\frac{dy}{dx}=0$ is

(A) $x-2=ce^{\tan^{-1}y}$ (B) $2xe^{\tan^{-1}y}=e^{2\tan^{-1}y}+c$

(C) $xe^{\tan^{-1}y}=\tan^{-1}y+c$ (D) $x^2e^{2\tan^{-1}y}=e^{\tan^{-1}y}+c$

Where c is an arbitrary constant.

17. If an integral curve of the differential equation $(y-x)\frac{dy}{dx}=1$ passes through (0, 0) and $(\alpha, 1)$, then $\alpha=$

(A) $2-e^{-1}$ (B) $1-e^{-1}$

(C) e^{-1} (D) $1+e$

18. The orthogonal trajectories of the family of curves $ay^2=x^3$, 'a' being the parameter, is a family of

(A) straight lines (B) circles

(C) parabolas (D) ellipses

19. A and B throw a dice. The probability that the number A gets is not greater than the number B gets, is

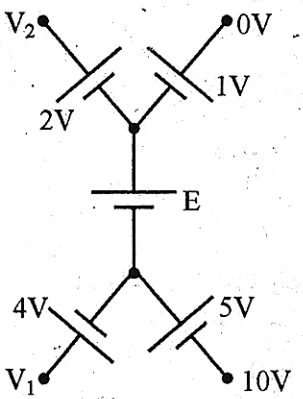
(A) $\frac{1}{2}$ (B) $\frac{1}{6}$

(C) $\frac{7}{12}$ (D) $\frac{5}{12}$

20. Five horses are in a race. Mr. A selects two of the horses at random and bets on them. The probability that Mr. A selected the winning horse, is

(A) $\frac{2}{5}$ (B) $\frac{4}{5}$

(C) $\frac{3}{5}$ (D) $\frac{1}{5}$

21. 

The value of the voltage source E in the given circuit is

(A) – 16V (B) 4V

(C) – 6V (D) 16V

22. If the voltage and current in an AC circuit are given by $v = 200 \sin(\omega t + 30°)$ and $i = 10 \sin(\omega t - 60°)$, then the power factor of the circuit is

(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}$

(C) 0 (D) $\frac{1}{\sqrt{2}}$

23. The voltage $v(t) = 5 \sin(60t - 60°)$ V is applied to a 20 μF capacitor. The current through the capacitor is

(A) $i(t) = 6 \sin(60t + 30°)$ mA (B) $i(t) = 6 \sin(60t + 45°)$ mA

(C) $i(t) = 6 \sin(60t - 30°)$ mA (D) $i(t) = 6 \sin(60t - 45°)$ mA

24. The frequency of power supply of a transformer designed for 60 Hz is changed to 50 Hz with voltage and current rating remaining same. Its efficiency will

(A) increase marginally. (B) increase by a factor of 1.2.

(C) remain unchanged. (D) decrease marginally

25. If a DC shunt motor is started with an open circuited field,

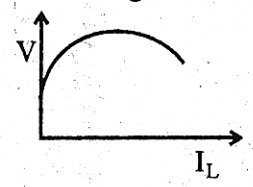
(A) the motor picks up fast and acquires full speed while drawing a large current.

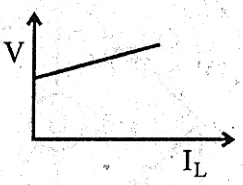
(B) the motor does not pick up speed but draws a large current.

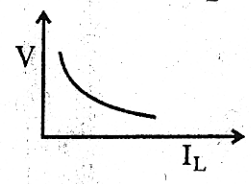
(C) the motor does not pick up speed and draws only a small current.

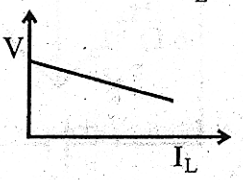
(D) the motor picks up fast and acquires full speed while drawing only a small current.

26. Which of the following curves depict the terminal voltage vs. load current characteristics of a DC shunt generator ?

(A) 

(B) 

(C) 

(D) 

27. When the stator of a three-phase induction motor is excited with a three-phase balanced supply, the rotor of the induction motor runs in the same direction as the rotating stator magnetic field. The law that is obeyed here is

(A) Faraday's law of electromagnetic induction
(B) Lenz's law
(C) Fleming's left-hand rule
(D) Newton's laws of motion

28. The phase sequence of a three-phase alternator can be reversed by

(A) reversing the field current and doubling the number of poles
(B) doubling the number of poles without reversing the field current
(C) reversing the field current keeping direction of rotation same
(D) reversing the direction of rotation keeping the field current same

29. A synchronous motor runs at Ns rpm at full load. Its speed at half of full load will

(A) be half of the rated rpm.
(B) be one fourth of the rated rpm.
(C) remain same
(D) be double the rated rpm.

30. Which of the following is **not** true for magnetic circuits ?

(A) Flux does not actually flow in the sense in which an electric current flow.
(B) Reluctance depends on the flux established in the circuit.
(C) Energy is needed only for creating flux.
(D) Flux flows in the same sense in which an electric current flow.

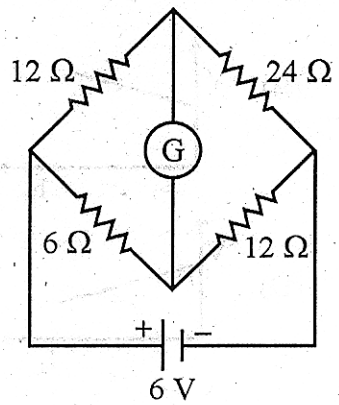
31. A 3-point starter is used to start

(A) induction motors
(B) shunt motors
(C) series motors
(D) both shunt and series motors

32. A stable UPS requires

(A) only a rectifier
(B) only an inverter
(C) both inverter and rectifier
(D) only battery

33. How much current flows through the galvanometer G in the given circuit ?



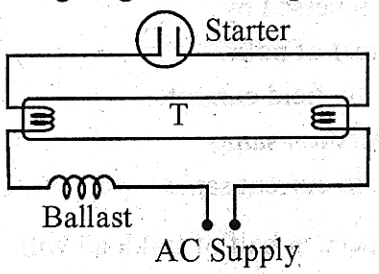
(A) 0
(B) 111 mA
(C) 167 mA
(D) 333 mA

34. Rating of a fuse is expressed in terms of

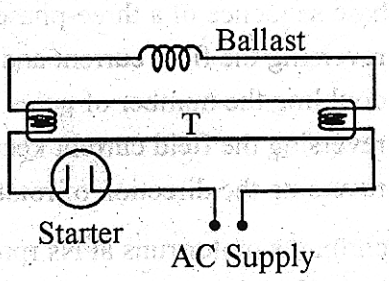
(A) voltage
(B) current
(C) VAR
(D) kVA

35. The wiring diagram of a single tube light is given by

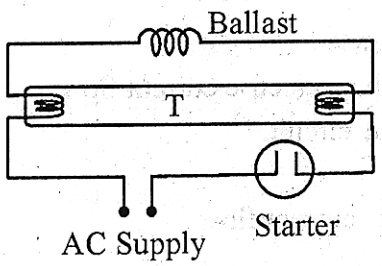
(A)



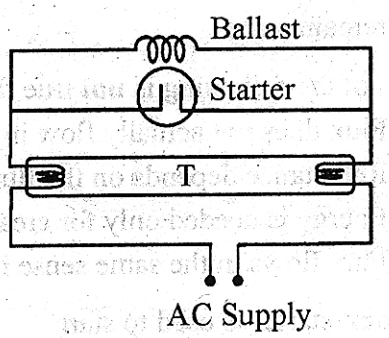
(B)



(C)



(D)



Computer Application

36. R(ABCD) F = {AB->CD, C->A, D->B}
Which of the following is not candidate key?

(A) AC
(B) AB
(C) CD
(D) BC

37. Data Base Management Systems are intended to-
(A) eliminate data redundancy
(B) establish relationships among records in different files
(C) manage file access & maintain data integrity
(D) all of these

38. The Zero Capacity queue-
(A) is referred to as a message system with buffering
(B) is referred to as a message system with no buffering
(C) is referred to as a link
(D) none of these

39. Multiprocessing-
(A) makes the operating system simpler
(B) is completely understood by all major computer vendors
(C) allows the same computer to have multiple processors
(D) allows multiple processes to run simultaneously

40. "_____ 'sweeps through' the graph, using a queue to remember the frontier of visited places" – fill in the blank.
(A) BFS (B) DFS
(C) BFS and DFS (D) NULL

41. Which of the following is essential for converting an infix expression to the postfix form efficiently?
(A) an operand stack and an operator stack (B) an operation stack
(C) a parse tree (D) an operand stack

42. If int s[5] is one dimensional array of integers, which of the following refers to the third element in the array?
(A) s + 2 (B) s + 3
(C) *[s + 3] (D) *[s + 2]

43. What will be the output of the following program?

```
main( )
{
    unsigned char I= 0;
    for (; I>=0; I++);
    printf("%d\n", I);
}
```

(A) Compiler error (B) Infinite loop
(C) 0 (D) 0 1

44. What is the main disadvantage of stop & wait flow control?
(A) Unreliable (B) Inefficient
(C) Attenuation (D) Dropped packets

45. Which of the following is an IEEE Project 802 standard?
(A) Ethernet (B) Token Ring
(C) Token Bus (D) All of these

46. "Flow control and error control is mainly function of the _____ layer." Fill in the blank.

(A) Application (B) Presentation
(C) Session (D) Data link

47. Dual-stack approach refers to-

(A) Implementing IPv4 with 2 stacks (B) Implementing IPv6 with 2 stacks
(C) Node has both IPv4 and IPv6 support (D) None of these

48. Project 802 specifies functions in the _____ of the OSI model. Fill in the blank.

(A) bottom layer (B) bottom 2 layers
(C) bottom 3 layers (D) bottom 4 layers

49. What will be the output of the following program?

```
#if something==0
int some=0;
#endif
main()
{
    int thing = 0;
    printf(" %d %d\n" , some, thing);
}
```

(A) Compiler error (B) 0 0
(C) 0 1 (D) 1 0

50. What will be the output of the following program?

```
main()
{
    void *v;
    int integer=2;
    int *i=&integer;
    v=i;
    printf(" %d" , (int*)*v);
}
```

(A) Compiler Error: cannot apply indirection on type void*
(B) Garbage value
(C) 2
(D) address

51. What will be the output of the following program?

```
main()
{
    main();
}
```

Output?

(A) Runtime error: Stack overflow (B) Garbage value
(C) 0 0 0 0 ... (D) 0 1 0 1 ...

52. Which of the following is not a 'concern' during the management of a software project?
(A) Money (B) Time
(C) Product quality (D) Product quantity

53. Which of the following is **not** a basic configuration used in data communication network ?
(A) Computer/peripheral device configuration
(B) Computer-to-computer communication
(C) Computer to front-end processor communication
(D) Communication through a data switch

54. In a resident - OS computer, which of the following system software must reside in the main memory under all situations?
(A) Assembler (B) Loader
(C) Linker (D) Compiler

55. Compiler can diagnose-
(A) Grammatical errors (B) Logical errors
(C) Runtime errors (D) None of these

Environmental Engineering

56. Potential of air pollution increases when the ventilation coefficient is-
(A) >11000 m^2/s (B) > 7000 m^2/s
(C) < 3600 m^2/s (D) < 6000 m^2/s

57. Sound intensity is measured in-
(A) $erg/s/m^2$ (B) W/m^2
(C) kW/m^2 (D) N/m^2

58. The catalyst used in catalytic converter is finely divided-
(A) Ni (B) P
(C) Pt (D) Fe

59. N_2 and O_2 are not greenhouse gases because-
(A) they do not have dipole moment.
(B) they have dipole moment.
(C) dipole moment does not occur during vibration.
(D) Both (B) and (C)

60. WAS stands for-
(A) Waste Activated System (B) Waste Affected Slurry
(C) Waste Activated Sludge (D) Waste Activation Stock

61. Which one of the following is true for Wastewater sample?
(A) BOD> COD (B) BOD< COD
(C) BOD= COD (D) BOD=1/ COD

62. Black foot disease is associated with-

(A) Lead pollution (B) Mercury pollution

(C) Arsenic pollution (D) Chromium pollution

63. Water would be considered saline if the TDS value is-

(A) 1500 mg/lit (B) 500 mg/lit

(C) 5000 mg/lit (D) 2500 mg/lit

64. The chemical responsible for cancer is-

(A) Hydrogen (B) Benzene

(C) Oxygen (D) Nitrogen

65. The apparatus in which the turbidity is measured as a function of intensity of light scattered as it passes through the water sample is called-

(A) Spectrometer (B) Nephelometer

(C) Tintometer (D) Turbidimeter

66. The best method of radioactive disposal is-

(A) Chemical processing (B) Storing under water

(C) Encapsulation (D) All of these

67. The biological decomposition of organic substances in waste under controlled condition is known as-

(A) Composting (B) Incineration

(C) Sanitary landfill (D) Pyrolysis

68. The end-product formed, after separation and anaerobic bacterial digestion of organic municipal solid wastes, is called-

(A) Compost (B) Humus

(C) Leachate (D) Ashes

69. Maximum permissible noise level above which prolonged noise causes permanent damage is-

(A) 100 dBA (B) 180 dBA

(C) 220 dBA (D) 250 dBA

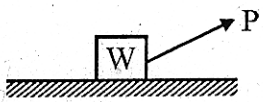
70. ISO 14000 or Environmental quality monitoring includes-

(A) Environmental Management System (B) Environmental Auditing

(C) Environmental Labelling (D) All of these

Question 71 to 100 for all candidates except Printing Technology and Agricultural Engineering Candidates

Engineering Mechanics

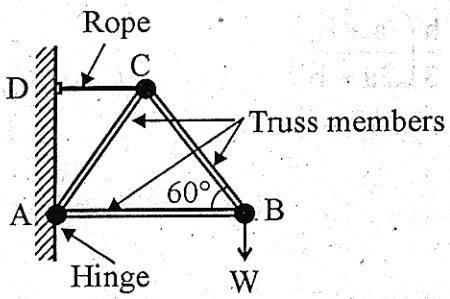
71. 

The minimum force required to slide a block of weight 'W' on a rough horizontal plane is

(A) $W \sin\theta$ (B) $W \cos\theta$

(C) $W \tan\theta$ (D) $W \cot\theta$

where θ is the angle of friction between the block and the horizontal plane.

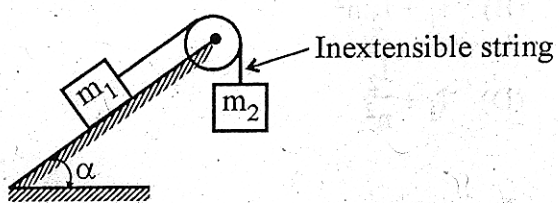
72. 

A three-member light weight plane truss ABC (with AB=BC) as shown in the figure is supported against a vertical wall by a horizontal rope CD. The force in the member AC will be

(A) $\frac{W}{\sqrt{3}}$, compressive (B) $\frac{W}{\sqrt{3}}$, tensile

(C) $\frac{2W}{\sqrt{3}}$, compressive (D) $\frac{2W}{\sqrt{3}}$, tensile

W being the weight suspended vertically from B.

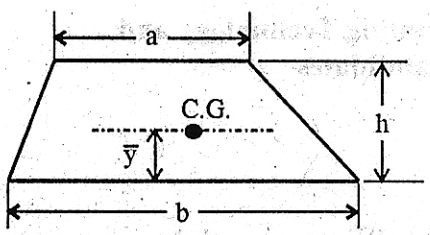
73. 

A block of mass m_1, placed on a smooth inclined plane with angle of inclination α to the horizontal, is connected to a mass m_2 hanging vertically as shown in the figure. If m_2 goes down, then the tension T in the inextensible string in the ensuing motion is

(A) $\frac{m_1 m_2 g(1+\sin\alpha)}{m_2 - m_1}$ (B) $\frac{m_1 m_2 g(1-\sin\alpha)}{m_2 + m_1}$

(C) $\frac{m_1 m_2 g(1-\sin\alpha)}{m_2 - m_1}$ (D) $\frac{m_1 m_2 g(1+\sin\alpha)}{m_2 + m_1}$

74.



The centre of gravity of a trapezoidal sheet with parallel sided a, b and height h lies at a distance $\bar{y}$ from the base b. The value of $\bar{y}$ is

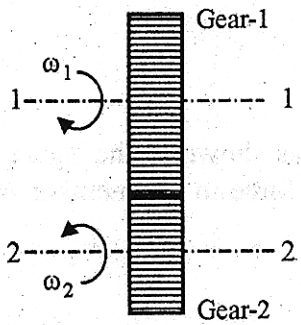
(A) $h\left(\frac{2a+b}{a+b}\right)$

(B) $\frac{h}{2}\left(\frac{2a+b}{a+b}\right)$

(C) $\frac{h}{3}\left(\frac{2a+b}{a+b}\right)$

(D) $\frac{h}{3}\left(\frac{a+b}{2a+b}\right)$

75.



Power is transmitted from one shaft to a parallel shaft by a pair of external spur gears. If I_1 be the mass moment of inertia of gear-1 about its own axis and I_2 be the same for gear-2 then equivalent moment of inertia of the gearing system referred to the axis of gear-1 is

(A) $I_1 + I_2.n$

(B) $I_1 + I_2.n^2$

(C) $I_1 + \frac{I_2}{n}$

(D) $I_1 + \frac{I_2}{n^2}$

Where n = speed ratio $= \frac{\omega_2}{\omega_1}$

76. Three forces acting on a rigid body are represented in magnitude, direction and line of action by the three sides of a triangle taken in order. The forces are equivalent to a couple whose moment is equal to

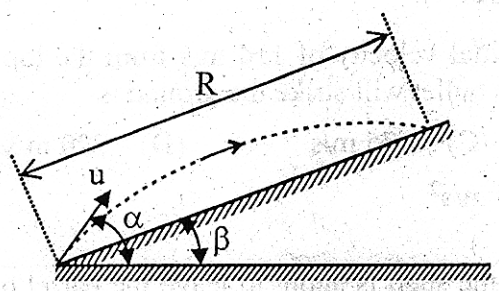
(A) Area of the triangle

(B) Twice the area of the triangle

(C) Half the area of the triangle

(D) Three times the area of the triangle

77.



A stone is projected from the base of an inclined plane with an inclination angle β to the horizontal. If α is the angle of projection with the horizontal, then for the range R to be the maximum on the inclined plane, relationship between α and β is

(A) $\alpha = 45° \sim \frac{\beta}{2}$ (B) $\alpha = 45° + \frac{\beta}{2}$ (C) $\alpha = \frac{45° + \beta}{2}$ (D) $\alpha = 30° + \frac{\beta}{2}$

78. A uniform heavy rod, lying on a rough horizontal table with coefficient of friction μ is pulled perpendicularly to its length by a string attached to the centre of the rod in the first case and in the second case, by a string attached to one end of the rod. The ratio of the string tensions required to just move (translate/rotate) the rod in the two cases will be

(A) $1:\left(\sqrt{2}+1\right)$ (B) $1:\left(2\sqrt{2}+1\right)$ (C) $\left(\sqrt{2}+1\right):1$ (D) $\left(2\sqrt{2}+1\right):1$

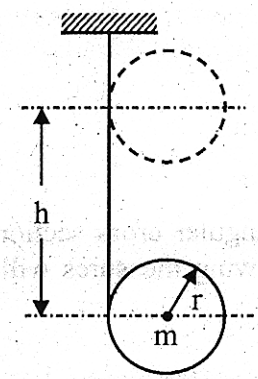
79. The diameters of the larger and the smaller pulleys of the upper block in the Weston's Differential pulley system are 60 cm and 50 cm respectively. The mechanical advantage of the system will be

(A) 5 (B) 6 (C) 10 (D) 12

80. The length of the arm of a single start screw is 180 cm. Seven complete turns of the screw cause the screw to advance through $\frac{2^{rd}}{3}$ of a decimeter along the axis. To raise a load of 1100 N at the head of the screw, the effort that should be applied at the end of the arm is

(A) $\frac{24}{27}$ N (B) $\frac{25}{27}$ N (C) $\frac{26}{27}$ N (D) 1 N

81.



A chord is wrapped around a cylinder of radius r and mass m. If the cylinder is released from rest, the velocity of the centre of the cylinder after it has moved through a vertical distance of h will be

(A) $\sqrt{2gh}$ (B) $\sqrt{4gh/3}$ (C) $\sqrt{gh}$ (D) $\sqrt{gh/3}$

82. A bullet is fired vertically upward with an initial velocity of 110 m/s from the top of a tower 115 m high. The velocity with which the bullet will strike the ground is

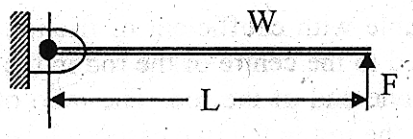
(A) 115 m/s (B) 120 m/s (C) 175 m/s (D) 220 m/s

Acceleration due to gravity may be taken as 10 m/s^2

83. A shell is fired from a cannon. At the instant the shell is about to leave the barrel of the cannon, its velocity relative to the barrel is 3 m/s. At that instant the barrel also swings upward with an angular velocity of 2 rad/s. If the barrel length is 2 m, the absolute velocity of the shell at that instant is

(A) 3 m/s (B) 4 m/s (C) 5 m/s (D) 7 m/s

84.



A uniform rigid rod of length L and weight W is hinged to a wall at one end and is supported horizontally by a vertical force F at the free end. If F is removed suddenly, magnitude of the instantaneous vertical reaction at the hinged end will be

(A) zero (B) $\frac{W}{4}$ (C) $\frac{W}{2}$ (D) W

85. A bus starts from rest with an acceleration of 1/3 m/s^2. A passenger standing directly behind the bus at a distance also starts to run toward the bus at the same time with a uniform velocity of 1 m/s. For the passenger to catch the bus, the initial distance between the bus and the passenger cannot be more than

(A) 1.5 m (B) 2.5 m (C) 2.75 m (D) 3 m

Strength of Materials

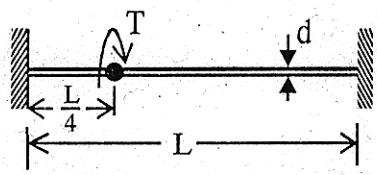
86. A transversely loaded cantilever beam of given length and rectangular cross section is found to deflect more than a specified value. Which of the following measures will be most effective to reduce the transverse deflection?

(A) Increase only the width of the beam, say by 10%

(B) Increase only the depth of the beam, say by 10%

(C) Change only the material of the beam for a higher Young's modulus, say by 10%

(D) Only decrease the load, say by 10%

87. 

A solid circular rod of diameter d and length L is fixed at both ends. A torque T is applied at a distance L/4 from the left end. The maximum shear stress developed in the rod is

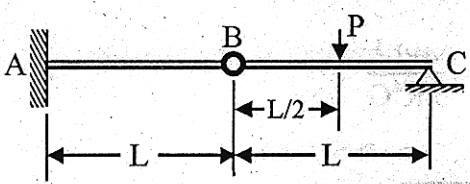
(A) $\frac{16T}{\pi d^3}$ (B) $\frac{12T}{\pi d^3}$

(C) $\frac{8T}{\pi d^3}$ (D) $\frac{4T}{\pi d^3}$

88. A shaft subjected to torsion experiences a pure shear stress τ at a point on the surface. The maximum principal stress at that point is

(A) $\frac{\tau}{\sqrt{2}}$ (B) $-\sqrt{2}\tau$

(C) $\frac{\tau}{2}$ (D) τ

89. 

A beam is made up of two identical bars AB and BC hinged at the common point B. The end A is fixed, and the end C is simply supported. With the load P acting as shown in the figure, the bending moment developed at the end A is

(A) $\frac{PL}{2}$ (B) $\frac{PL}{3}$

(C) zero (D) indeterminate

90. The Young's modulus of an isotropic material is 2.5 times its shear modulus (modulus of rigidity). The Poisson's ratio of the material is

(A) 0.2 (B) 0.25

(C) 0.3 (D) 0.35

91. A metallic rod of length 500 mm and diameter 50 mm, when subjected to a tensile force of 100 kN at the ends, experiences an increase in its length by 0.5 mm and a reduction in diameter by 0.015 mm. The Poisson's ratio of the material of the rod is

(A) 0.2 (B) 0.25

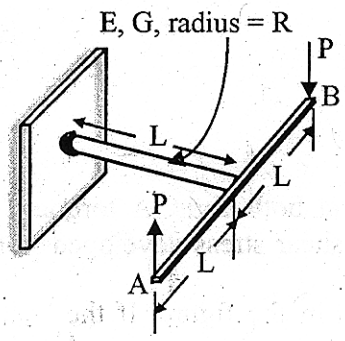
(C) 0.3 (D) 0.35

92. The nature of distribution of transverse shear stress in a beam subjected to transverse load is

(A) linear (B) parabolic

(C) hyperbolic (D) elliptic

93.



A rigid horizontal thin strip of length 2L is fixed at the free end of a circular cantilever of radius R and length L as shown in the figure. Vertical forces of magnitudes P are applied at the ends of the strip as shown. The modulus of elasticity and rigidity of the material of the cantilever are E and G respectively. The vertical deflection at point A due to the load is

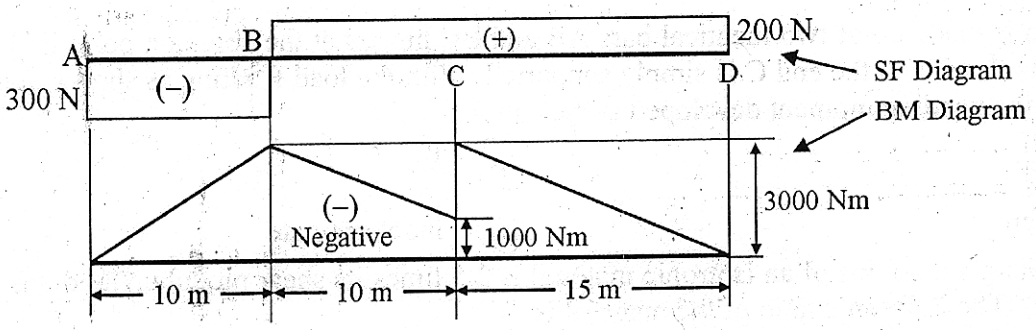
(A) $\frac{PL^3}{\pi R^4 G}$

(B) $\frac{PL^3}{\pi R^4 E}$

(C) $\frac{2PL^3}{\pi R^4 E}$

(D) $\frac{4PL^3}{\pi R^4 G}$

94.



Shear force and bending moment diagrams for a beam ABCD is shown. It can be concluded that

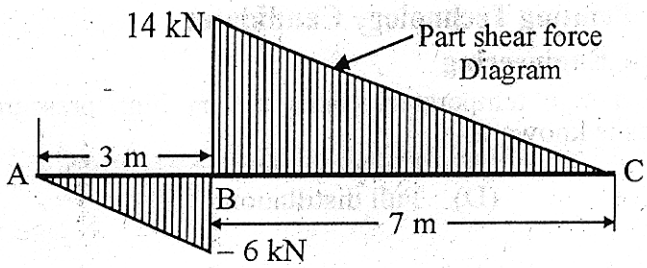
(A) The beam has three supports

(B) End A is fixed

(C) A positive bending moment (concentrated) of 2000 Nm acts at C

(D) A uniformly distributed load acts in the portion BC

95.



The part of the shear force diagram for a beam is shown in the figure. If the bending moment at B is – 9 kN.m, then bending moment at C is

(A) 40 kNm (B) 58 kNm (C) 116 kNm (D) – 80 kNm

96. If the length of a long column is reduced by 20%, the critical load of buckling for the column will

(A) increase by 40% exactly (B) decrease by 20% exactly
(C) increase by 46% nearly (D) increase by 56% nearly

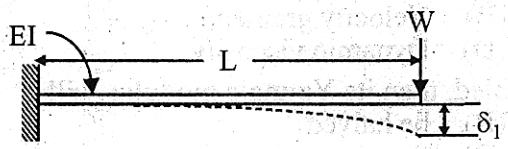
97. A column of square cross-section of size 10 mm by 10 mm and length 300 mm has both ends fixed. This is replaced by a circular cross-section column of diameter 10 mm of same length, same material and with same end conditions. The ratio of the critical stresses for square cross-section column to that for the circular cross-section column based on the Euler's critical load is

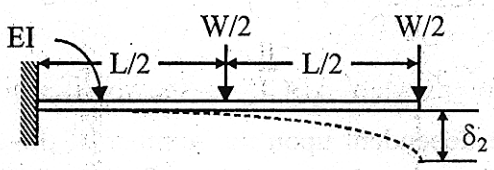
(A) 1:4 (B) 3:4 (C) 4:3 (D) 4:1

98. Consider a column of a material with modulus of elasticity as 64 GPa and yield strength of 40 MPa. The least value of the slenderness ratio of the column will be nearly

(A) 60 (B) 75 (C) 100 (D) 125

99.





With reference to the same cantilever beam, but loaded differently as shown, $\frac{\delta_2}{\delta_1}$ equals

(A) $\frac{2}{3}$ (B) $\frac{21}{32}$ (C) $\frac{13}{12}$ (D) $\frac{5}{12}$

100. The impact strength of a material is an index of its

(A) hardness (B) toughness
(C) resistance to corrosion (D) resistance to failure under reversal of stress

Question 71 to 100 for Printing Technology Candidates

Basic Engineering

71. A process of heating crude oil to a high temperature under a very high pressure to increase the yield of lighter distillates is known as-
(A) Cracking (B) Carbonization
(C) Fractional distillation (D) Full distillation

72. Centrifugal tension in belts-
(A) reduces power transmission
(B) increases power transmission
(C) does not affect power transmission
(D) increases power transmission at high speed and decreases it at lower speed

73. The property which enables one material to cut another material is referred to as-
(A) Brittleness (B) Hardness (C) Ductility (D) Toughness

74. The threads on the lead screw of a Lathe are called-
(A) acme threads (B) square threads
(C) knuckle threads (D) buttress threads

75. The ability of a material to resist fracture due to high impact loads is called-
(A) Strength (B) Stiffness (C) Toughness (D) Brittleness

76. Modulus of rigidity is the ratio of -
(A) axial stress to lateral strain (B) shear stress to shear strain
(C) linear stress to longitudinal strain (D) hydrostatic stress to volumetric strain

77. The maximum bending moment of a simply supported beam of span l and carrying a point load W at the centre of beam is-
(A) Wl/4 (B) Wl/2 (C) Wl (D) $Wl^2/4$

78. The point on the cam pitch having the maximum pressure angle is called
(A) trace point (B) pitch point (C) base point (D) prime Point

79. Poise is the unit of-
(A) Density (B) Velocity gradient
(C) Kinematic viscosity (D) Dynamic viscosity

80. If the radius of a rod, stretched by a load is doubled, then its Young's modulus will-
(A) be doubled (B) be halved
(C) become four times (D) remain unaffected

81. Increase in number of rows of rivets results in-
(A) decrease in efficiency of joint.
(B) increase in efficiency of joint.
(C) no change in efficiency.
(D) increase or decrease in efficiency of joint dependent upon the number of the rivets used.

82. Surface finish on a drawing is represented by-
(A) circles (B) triangles (C) squares (D) rectangles

83. Ceramic cutting tools are fixed to the tool body by-
(A) clamping (B) welding (C) soldering (D) brazing

84. The commonly used flux for brazing is-
(A) resin (B) soft silver (C) borax (D) soft iron

85. Cutting action of the grinding wheel is improved by a process called
(A) Facing (B) Clearing (C) Truing (D) Dressing

Printing Material Science

86. The higher the colour temperature the emitted light will be rich in-
(A) blue rays (B) yellow rays (C) green rays (D) red rays

87. Farmer's reducer consists of aqueous solution of-
(A) Potassium iodide & Iodine.
(B) Cerium (IV) sulphate acidified with sulphuric acid
(C) Potassium Ferricyanide and Sodium Thiosulphate
(D) Potassium Ferricyanide and Sodium Iodide

88. Heat-set Inks dry by-
(A) absorption (B) evaporation
(C) polymerization (D) both evaporation and oxidation

89. Rosin Size is added in the beater to reduce which property of the paper?
(A) Paper Strength (B) Absorbency (C) Smoothness (D) Opacity

90. Paper used with heat-set inks should have-
(A) high tensile strength (B) high absorbency
(C) high smoothness (D) high moisture resistance

91. Image areas are in recess in which of the following printing process?
(A) Intaglio (B) Gravure (C) Waterless offset (D) All of these

92. Depth of field of Fixed Focal Length Camera is _____ than that of the SLR Camera.
(A) equal (B) lower (C) higher (D) None of these

93. In halftone gravure, which of the following factors is/are correct ?
(A) Two exposures are given; one by continuous tone positives and other by halftone positives.
(B) Depth of well varies
(C) Opening of well varies
(D) All of these

94. Hydroquinone is inactive below pH value of-
(A) 13 (B) 9 (C) 11 (D) 10

95. Which of the following is added to increase the opacity of paper?
(A) $CaCO_3$ (B) TiO_2 (C) $BaSO_4$ (D) $CaCl_2$

96. Viscosity of Paste Ink is-
(A) 10-30 Poise (B) 100-300 Poise (C) 50-100 Poise (D) 35-45 Poise

97. A good offset blanket should have-
(A) minimum stretch factor (B) good ink release property
(C) good ink transfer property (D) All of the above

98. Effect of static electricity is maximum in-
(A) Offset (B) Letterpress (C) Gravure (D) Flexography

99. Anilox inking roller is used in-
(A) Offset printing (B) Flexography (C) Gravure printing (D) Letterpress

100. Hydroquinone as a reducer gives image which is-
(A) High Contrast (B) High Resolution
(C) Low Contrast (D) Medium Contrast

Question 71 to 100 for Agricultural Engineering Candidates

Soil & Water Engineering

71. In surveying, the instrument Optical Square is used for
(A) Marking parallel lines in chain surveying
(B) Determining the elevation of two different levels in the field
(C) Drawing the contours
(D) Marking right angles in the field

72. Which of the following pump is most suitable for river lift irrigation project ?
(A) Centrifugal pump (B) Jet Pump
(C) Submersible pump (D) Reciprocating pump

73. A _____ is an imaginary line of constant elevation on the surface of the ground.
(A) Profile line (B) Benchmark line (C) Hydrograph (D) Contour

74. The total depth of irrigation to a crop in centimetre is called
(A) Base (B) Duty
(C) Intensity of irrigation (D) Delta

75. A cavity tube well does not have
(A) Pump (B) Casing pipe (C) Strainer pipe (D) Drawdown

76. Bernoulli's theorem is the application of the law of
(A) Conservation of mass to the fluid flow
(B) Conservation of energy to the fluid flow
(C) Conservation of heat to the fluid flow
(D) Conservation of momentum to the fluid flow

77. The ratio of shearing stress to shearing strain is known as
(A) Modulus of elasticity (B) Bulk modulus of elasticity
(C) Modulus of rigidity (D) Poisson's ratio

78. How many hectares of wheat crop can be irrigated by a water pump having a discharge of 10,000 litres per hour if the required depth of irrigation is 5 cm, irrigation interval is 15 days and the pump is operated for 10 hours per day ?
(A) 1.5 (B) 3.0 (C) 5.0 (D) 7.5

79. Bunds, dams and drains are constructed to prevent
(A) Stream bank erosion (B) Sheet erosion
(C) Slip erosion (D) Gully erosion

80. Mulching helps in
(A) Moisture conservation (B) Weed control
(C) Improvement of soil structure (D) Increasing soil fertility

Farm Machinery & Power

81. The Brake Thermal Efficiency of diesel engine is about
(A) 25% (B) 35% (C) 75% (D) 85%

82. The grade of lubrication oil used for tractor engine is
(A) SAE 40 (B) SAE 60 (C) SAE 90 (D) SAE 120

83. Which of the following things is not a part of cooling system of tractor ?
(A) Thermostat valve (B) Pump
(C) Rocker arm (D) Radiator

84. The function of clutch is to
(A) Engage and disengage power (B) Conserve energy of power stroke
(C) Actuate engine valves (D) Facilitate turning of tractor

85. Ballasting of tractor is done to improve
(A) Field capacity (B) Field efficiency
(C) Fuel efficiency (D) Tractive ability

86. In disc plough, the depth of cut can be increased by
(A) Decreasing tilt angle (B) Increasing operational speed
(C) Decreasing disc angle (D) Increasing disc angle

87. Drum seeders are used for sowing
(A) Jute (B) Wheat (C) Paddy (D) Mustard

88. Which of the followings is not a component of disc harrow ?
(A) Scraper (B) Gang (C) Reel (D) Spool

89. The biogas yield per kg of fresh cattle dung at STP is about
(A) 0.4 cm^3 (B) 0.04 m^3 (C) 0.4 m^3 (D) 4.0 m^3

90. The adopted value of Solar Constant is
(A) 1637 W/m^2 (B) 1637 kW/m^2 (C) 1367 W/m^2 (D) 1367 kW/m^2

Food Processes & Post Harvest Engineering

91. The heat transfer efficiency of a plate type heat exchanger is about
(A) 75% (B) 55% (C) 40% (D) 25%

92. The temperature and holding time in flash pasteurization is
(A) 61 °C and 30 minutes (B) 71 °C and 15 seconds
(C) 71 °C and 30 seconds (D) 110 °C and 2 seconds

93. Homogenizers reduce the size of fat globules to about _____ microns.
(A) 2 (B) 10 (C) 25 (D) 50

94. Grading refers to
(A) Separation of cleaned product (B) Separation of uncleaned product
(C) Classification of cleaned product (D) Classification of uncleaned product

95. A thin layer grain drying is one in which grain thickness should be
(A) less than 50 cm (B) less than 100 cm
(C) 20 cm (D) more than 20 cm

96. If moisture content (wet basis) is 15%, moisture content in dry basis will be.
(A) 11% (B) 19.5% (C) 2.3% (D) 17.6%

97. The moisture content of a substance in excess of the equilibrium moisture is known as
(A) Free moisture (B) Bound moisture
(C) Unbound moisture (D) Critical moisture

98. Drying process means removal of moisture due to simultaneous _____ and _____ transfer.
(A) volume, shape (B) heat, mass
(C) moisture, vapour (D) density, specific gravity

99. Reduction of food grains into various edible end products is called
(A) Grinding (B) Milling (C) Shelling (D) Splitting

100. Psychrometry deals with the properties of
(A) Air-water vapour mixture (B) Air- gas mixture
(C) Gas- vapour mixture (D) Air-vapour mixture

SPACE FOR ROUGH WORK