

Booklet No.

88115903

JELET—2018

For Diploma in Engg. & Tech. Candidates

Time : 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 mark 1. In case of incorrect answer or any combination of more than one answer, $\frac{1}{4}$ mark 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. 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 OMRs will be processed by electronic means. Hence it is liable to become invalid if there is any mistake in the question booklet number or roll number entered or if there is any mistake in filling corresponding bubbles. Also it may become invalid if there is any discrepancy in the name of the candidate, name of the examination centre or signature of the candidate vis-a-vis what is given in the candidate's admit card. 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, docu-pen, log table, 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.

SEAL

SEAL

SPACE FOR ROUGH WORK

Direction : Question Nos. 1 to 70 for all candidates

Mathematics

1. The number of real roots of the equation $x^3 + x - 1 = 0$ is
(A) 0 (B) 1 (C) 2 (D) 3

2. Let

$$A = \begin{pmatrix} 12 & 24 & 5 \\ x & 6 & 2 \\ -1 & -2 & 3 \end{pmatrix}$$

The value of x for which A is not invertible is

- (A) 6 (B) 12 (C) 3 (D) 2
3. Let the quadratic equation $ax^2 + bx + c = 0$ have imaginary roots only and the real coefficients a, b, c obey the relation $a + b + c < 0$. Then
(A) $a > 0, c < 0$ (B) $a < 0, c > 0$ (C) $a > 0, c > 0$ (D) $a < 0, c < 0$
4. If α, β, γ are the roots of the equation $x^3 + 3x^2 + x - 1 = 0$, then the value of $\Sigma \alpha^2 \beta$ is
(A) -6 (B) 6 (C) 4 (D) -4
5. If $\left(\frac{1-i}{1+i}\right)^{100} = a + ib$ ($a, b \in \mathbb{R}$), then

- (A) $a = 2, b = -1$ (B) $a = 1, b = 0$
(C) $a = 0, b = 1$ (D) $a = -1, b = 2$

6. The polynomial $x^n + 1$ is divisible by $(x + 1)$ if

- (A) n is odd (B) n is even
(C) n is any number (D) n is any integer

7. If the equation $2hxy + gx + fy + c = 0$ ($h \neq 0$) represents a pair of straight lines, then

- (A) $fg = ch$ (B) $fg = 2ch$
(C) $2fg = ch$ (D) $fgh = c^2$

8. The ratio in which the straight line joining the points $(1, -3, 5)$ and $(7, 2, 3)$ is divided by the x - y plane is

- (A) 3 : 5 internally (B) 5 : 3 externally
(C) 5 : 3 internally (D) 3 : 5 externally

9. The minimum value of $\frac{e^x}{x^2}$ is

- (A) e (B) $\frac{e^2}{4}$ (C) $\frac{e^3}{9}$ (D) e^2

10. The curve $y = 5 + \sin(x - 5)$

- (A) does not cut the x -axis
(B) cuts the x -axis at one point only
(C) cuts the x -axis at finitely many points
(D) cuts the x -axis at infinitely many points

11. Let $f(x) = e^x$, $g(x) = \log_e x$ ($x > 0$), then $(g \circ f)'(x)$ where $(g \circ f)(x) = g[f(x)]$ is equal to

- (A) 0 (B) 1 (C) e (D) $1 + e$

12. If $f(x, y) = x^3 + x^2y - xy^2 - y^3$, then $x \frac{\partial f}{\partial x} + y \frac{\partial f}{\partial y}$ is equal to

- (A) $f(x, y)$ (B) $3f(x, y)$ (C) $2f(x, y)$ (D) $x^3 - y^3$

13. The value of

$$\int \frac{x^2 - 1}{x^2 \left\{ 5 + \left(x + \frac{1}{x} \right)^2 \right\}} dx$$

is

- (A) $\frac{1}{\sqrt{5}} \tan^{-1} \frac{x^2 + 1}{\sqrt{5}x} + c$ (B) $\frac{1}{2\sqrt{5}} \tan^{-1} \frac{x^2 + 1}{\sqrt{5}x} + c$
(C) $\frac{1}{\sqrt{5}} \tan^{-1} \frac{x^2 - 1}{\sqrt{5}} + c$ (D) $\frac{1}{3\sqrt{5}} \tan^{-1} \frac{x^2 - 1}{\sqrt{5}x^2} + c$

(c is constant of integration)

14. The value of $\int_0^{\log 2} \frac{e^x dx}{1+e^x}$ is

(A) $\log \frac{1}{2}$

(B) $\log \frac{5}{2}$

(C) $\log \frac{3}{2}$

(D) $\log \frac{7}{2}$

15. The curve $(3x^2 + 4y^2)^2 - (7x^2 + 2y^2) = 0$ has

(A) no tangent at origin

(B) one tangent at origin

(C) two tangents at origin

(D) three tangents at origin

16. The equation of the normal at $\left(\frac{a}{2}, \frac{\sqrt{3}a}{2}\right)$ of the circle $x^2 + y^2 = a^2$ is

(A) $x + \sqrt{3}y = 2a$

(B) $\sqrt{3}y - x = a$

(C) $\sqrt{3}x + y = \sqrt{3}a$

(D) $\sqrt{3}x - y = 0$

17. The differential equation $y dx - 2x dy = 0$ represents a family of

(A) straight lines

(B) parabolas

(C) circles

(D) catenaries

18. The family of circles having centre at origin, is represented by the differential equation

(A) $x - y \frac{dy}{dx} = 0$

(B) $x + y \frac{dy}{dx} = 0$

(C) $y - x \frac{dy}{dx} = 0$

(D) $y + x \frac{dy}{dx} = 0$

19. If

$$A = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix} (\theta \in \mathbb{R})$$

then A is

(A) symmetric

(B) skew-symmetric

(C) orthogonal

(D) singular

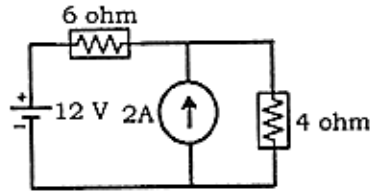
20. Let the vectors from the origin to the points A, B, C, D be respectively

$$\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = 2\hat{i} + 3\hat{j}, \vec{c} = 3\hat{i} + 5\hat{j} - 2\hat{k}, \vec{d} = \hat{k} - \hat{j}$$

Then the lines AB and CD

- (A) are perpendicular (B) intersect at (1, 1)
(C) intersect at (1, -1) (D) are parallel
- Electrical Technology**
21. In a DC circuit, the efficiency at maximum power transfer is
(A) 100% (B) 50% (C) 75% (D) 80%
22. A capacitor of value $100 \mu\text{F}$ is charged to 1000 V. Then the stored electrostatic energy in the capacitor is
(A) 250 J (B) 50 J (C) 150 J (D) 100 J
23. A cast-steel electromagnet has an air-gap of length 2 mm and an iron path of length 30 cm. Find the number of ampere turns necessary to produce a flux density of 0.8 Wb/m^2 . Neglect leakage and fringing. Given $H = 730 \text{ AT/m}$ at $B = 0.8 \text{ Wb/m}^2$ for cast steel.
(A) $\approx 1492 \text{ AT}$ (B) $\approx 1942 \text{ AT}$ (C) $\approx 1842 \text{ AT}$ (D) $\approx 1924 \text{ AT}$
24. What will be the power consumption of a 230 V, 100 W lamp when connected to a 115 V power supply?
(A) 100 W (B) 50 W (C) 25 W (D) 75 W
25. In a series $R-L-C$ circuit at resonance draws current of 1 A from a 100 V, 50 Hz supply. The inductance of the circuit is 0.1 H. The maximum energy stored in the inductor is
(A) 0.1 J (B) 0.01 J (C) 1 J (D) 10 J
26. A star connected load is excited by a balanced three-phase supply of 220 V, 50 Hz. Per phase load consists of resistance 6 ohms and inductive reactance 8 ohms. Find the total power input.
(A) $\approx 290 \text{ W}$ (B) $\approx 2904 \text{ W}$ (C) $\approx 4000 \text{ W}$ (D) $\approx 8712 \text{ W}$

27. Find the current flowing through the 6 ohms resistance in the circuit



- (A) 0.8 A (B) 0.4 A (C) 4 A (D) 2 A

28. In a permanent magnet moving coil instrument, the deflecting torque is produced due to

- (A) magnetic effect
(B) damping
(C) change in mechanical potential energy
(D) variation in inductance

29. The yoke of a transformer is made of

- (A) solid steel bar (B) steel lamination
(C) copper lamination (D) hollow steel cylinder

30. The slip of a 3- ϕ induction motor is 5% and the synchronous speed is 600 r.p.m. The rotor speed is

- (A) 570 r.p.m. (B) 30 r.p.m.
(C) 630 r.p.m. (D) 300 r.p.m.

31. For same power transmission, same power loss, same power factor and same maximum voltage between two conductors, the ratio of copper requirement for a.c. 3- ϕ , 3-wire system in comparison to a.c. 1- ϕ , 2-wire system is

- (A) 0.67 (B) 2
(C) 1.5 (D) 0.75

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32. The impulse turbine used in hydro-electric power station is
- (A) Propeller turbine (B) Francis turbine
(C) Pelton wheel (D) Kaplan turbine
33. The indicating instrument gives accurate result when the damping provided is
- (A) slightly greater than critical damping
(B) slightly less than under-damping
(C) critical damping
(D) slightly less than critical damping
34. The readings of two wattmeter when connected to a 3- ϕ balanced load are 50 W and 150 W. The total reactive power of the circuit
- (A) cannot be determined by these readings
(B) is $100\sqrt{3}$ VAR
(C) is 100 VAR
(D) is $200\sqrt{3}$ VAR
35. Of the following, which is not a low-voltage circuit breaker?
- (A) MOCB (B) RCCB
(C) MCB (D) MCCB

Computer Application

36. A technique used by codes to convert an analog signal into a digital bit stream is known as
- (A) query processing (B) pulse stretcher
(C) pulse code modulation (D) queue management
37. As compared to diskettes, the hard disks are
- (A) more expensive (B) more portable
(C) less rigid (D) slowly accessed

38. An interpreter is a translating program which
- (A) translates instruction of a high-level language into machine language
 - (B) translates a line of source program into machine language program
 - (C) is involved in program's execution
 - (D) All of the above
39. The arranging of data in a logical sequence is called
- (A) sorting
 - (B) classifying
 - (C) reproducing
 - (D) summarizing
40. Which of the following are the two main components of the CPU?
- (A) Control unit and registers
 - (B) Registers and main memory
 - (C) Control unit and ALU
 - (D) ALU and bus
41. Programs designed to perform specific tasks is known as
- (A) system software
 - (B) application software
 - (C) utility programs
 - (D) operating system
42. EBCDIC can code up to how many different characters?
- (A) 256
 - (B) 16
 - (C) 32
 - (D) 64
43. Time during which a job is processed by the computer is
- (A) delay time
 - (B) real time
 - (C) execution time
 - (D) down time
44. The feature that database allows to access only certain records in database is
- (A) forms
 - (B) reports
 - (C) queries
 - (D) tables

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45. Which protocol provides e-mail facility among different hosts?
- (A) FTP (B) SMTP
(C) TELNET (D) SNMP
46. VGA is
- (A) Video Graphics Array (B) Visual Graphics Array
(C) Volatile Graphics Array (D) Video Graphics Adapter
47. WAN stands for
- (A) Wap Area Network (B) Wide Area Network
(C) Wide Array Net (D) Wireless Area Network
48. Which operation is not performed by computer?
- (A) Inputting (B) Processing
(C) Controlling (D) Understanding
49. Which one of the following is not an application software package?
- (A) Redhat Linux (B) Microsoft Office
(C) Adobe PageMaker (D) Open Office
50. What is the output of this C code?
- ```
#include<stdio.h>
main()
{
 int a=0, b=1;
 if (b>0)
 if (a>0)
 printf("True");
 else
 printf("False");
}
```
- (A) True (B) False  
(C) No output will be printed (D) Run time error

51. A C preprocessor can start with

- (A) a number
- (B) a special symbol other than underscore
- (C) \$
- (D) #

52. Which one of the following is not an operating system?

- (A) Android
- (B) Linux
- (C) Google
- (D) Windows

53. A laser printer does NOT use

- (A) a photo-conductive drum
- (B) a print head
- (C) a laser beam
- (D) None of the above

54. Web browser uses

- (A) TCP/IP
- (B) HTTP
- (C) SMTP
- (D) TELNET

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55. \_\_\_\_ is a technique of conversion between the representation of digital data in user equipment and the corresponding signals transmitted over a communication channel.

- (A) Line coding
- (B) Demodulation
- (C) Modulation
- (D) Segmentation

### **Environmental Engineering**

56. In nephrotoxicity, the targeted body part is

- (A) kidney
- (B) liver
- (C) lungs
- (D) brain

57. Which of the following is an example of *in situ* conservation?

- (A) Deer park
- (B) Seed bank
- (C) Wildlife sanctuary
- (D) Aquarium

58. 'Itai itai' disease was caused by

- (A) zinc
- (B) cadmium
- (C) lead
- (D) mercury

59. The unit of intensity of sound is

- (A)  $Wm^{-2}$
- (B)  $Nm^{-2}$
- (C) decibel
- (D) bel

60. MIC is

- (A) a primary pollutant
- (B) a secondary pollutant
- (C) criteria pollutants
- (D) Both contaminant and pollutant

61. Freon is

(A)  $\text{CF}_3\text{Cl}$

(B)  $\text{CFCl}_3$

(C)  $\text{CF}_2\text{Cl}_2$

(D)  $\text{CHCl}_3$

62. For rural areas, most suitable solid waste disposal method is

(A) incineration

(B) landfill

(C) pyrolysis

(D) composting

63. The portion of the refuse which consists of food produced during its preparation or storage, is known as

(A) Rubbish

(B) Garbage

(C) Ashes

(D) Cinders

64. Aerobic method of composting practised in India is called

(A) Bangalore method

(B) Nagpur method

(C) Delhi method

(D) Indore method

65. A mechanism, which ensures post-project environmental quality monitoring is called

(A) Environmental Impact Assessment

(B) Environmental Audit

(C) Environmental Labelling

(D) Environmental Management System

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66. Natural reservoirs of water below the earth's surface is

- (A) Aquiclude (B) Aquifer  
(C) Aquitard (D) Aqueduct

67. The World Environment Day is

- (A) 5<sup>th</sup> June (B) 5<sup>th</sup> July  
(C) 5<sup>th</sup> October (D) 5<sup>th</sup> January

68. Noise is

- (A) unwanted sound  
(B) constant sound  
(C) sound of high frequency  
(D) loud sound

69. Incineration of solid waste is generally performed at temperature range

- (A) 900–1200 °C (B) 0–50 °C  
(C) 200–300 °C (D) 400–500 °C

70. Zinc phosphide is an example of

- (A) fumigant (B) fungicide  
(C) rodenticide (D) antibiotic

**Direction :** Question Nos. 71 to 100 for all candidates except Printing Technology and Agricultural Engineering Candidates

### Engineering Mechanics

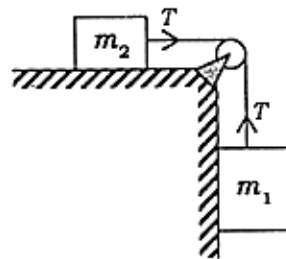
71. \_\_\_\_ do not have identical dimensions.

- (A) Torque and work
- (B) Momentum and impulse
- (C) Moment of a force and angular momentum
- (D) Torque and energy

72. A man and a boy carry a concentrated weight of 300 N by means of a uniform pole of 2 m length and weight of 100 N. They carry the pole on their shoulders at the ends of the pole. Where the weight must be placed (distance from the man end) so that the man may bear twice of that the boy has to carry?

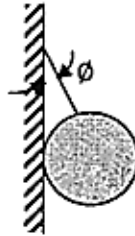
- (A) 0.356 m approx
- (B) 0.456 m approx
- (C) 0.556 m approx
- (D) 0.656 m approx

73. As shown in the figure, two bodies of masses  $m_1$  and  $m_2$  are connected by a light inextensible string passing over a smooth pulley. Mass  $m_2$  lies on a smooth horizontal plane. When the system is let go from equilibrium, the tension in the string will be ( $m_1 > m_2$ )



- (A)  $\frac{m_1 m_2}{m_1 + m_2} g$
- (B)  $\frac{m_1 m_2}{m_1 - m_2} g$
- (C)  $\frac{2m_1 m_2}{m_1 + m_2} g$
- (D)  $\frac{2\sqrt{m_1^2 + m_2^2}}{m_1 + m_2} g$

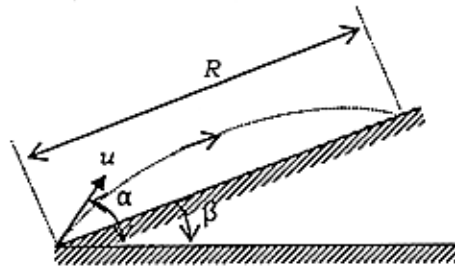
74. A uniform sphere of radius  $r$ , held by an inextensible string from a wall fastened to a point on the surface of the sphere is in equilibrium while in contact with the smooth vertical wall. If the length of the string is also  $r$ , then the angle  $\phi$  made by the string with the vertical will be



- (A)  $25^\circ$                       (B)  $30^\circ$                       (C)  $45^\circ$                       (D)  $60^\circ$
75. Time period of a simple pendulum will be doubled if
- (A) its length is doubled
- (B) its length is halved
- (C) its length is quadrupled
- (D) the mass of its bob is doubled
76. The area moment of inertia about a diagonal of a square plate of side  $a$  is
- (A)  $\frac{a^4}{24}$                       (B)  $\frac{a^4}{12}$
- (C)  $\frac{a^4}{3}$                       (D)  $\frac{a^4}{2}$
77. A man stands on a spring-type weight scale in a lift which carries him upwards with acceleration. The reading on the weighing scale will be
- (A) zero
- (B) true weight of the man
- (C) lower than true weight of the man
- (D) higher than true weight of the man

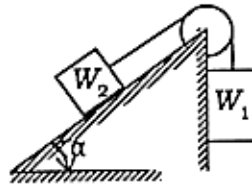


78. Range ( $R$ ) along the inclined plane (angle of inclination  $\beta$ ) of a projectile thrown in the vertical plane from the base of the inclined plane with an initial velocity  $u$  at an angle  $\alpha$  with the horizontal, as shown in the figure, is



- (A)  $\frac{2u^2 \sin(\alpha + \beta) \cos \alpha}{g \cos^2 \beta}$                       (B)  $\frac{2u^2 \sin(\alpha - \beta) \cos \alpha}{g \cos^2 \beta}$
- (C)  $\frac{u^2 \sin(\alpha - \beta) \cos \alpha}{g \cos \beta}$                       (D)  $\frac{u^2 \sin^2(\alpha - \beta) \cos \alpha}{g \cos \beta}$

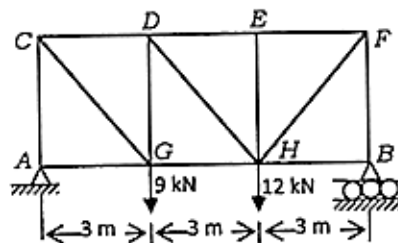
79. In case of motion of two bodies of weights  $W_1$  and  $W_2$  ( $W_1 > W_2$ ) connected by an inextensible string, one end of which hangs freely and the other lies on a smooth inclined plane of inclination angle  $\alpha$  with the horizon, the acceleration of the weights is



- (A)  $\frac{W_1 + W_2 \sin \alpha}{W_1 + W_2} \cdot g$                       (B)  $\frac{W_1 - W_2 \sin \alpha}{W_1 + W_2} \cdot g$
- (C)  $\frac{(W_1 - W_2) \sin \alpha}{W_1 + W_2} \cdot g$                       (D)  $\frac{W_1 + W_2 \sin \alpha}{W_1 - W_2} \cdot g$

( $g$  = acceleration due to gravity)

80. A plane truss of span 9 m and height 4 m is loaded as shown in the figure. The force in the member  $EF$  is

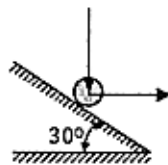


- (A) 6.25 kN                      (B) 7.25 kN                      (C) 8.25 kN                      (D) 9.25 kN

81. The velocity vs. time graph of a body is a straight line passing through the origin. If the slope of the line is  $m$ , the distance travelled by the body in time  $t$  from the beginning would be

- (A)  $\frac{t^2}{2m}$                       (B)  $\frac{mt^2}{2}$                       (C)  $\frac{2mt^2}{3}$                       (D)  $mt^2$

82. A ball falling vertically, strikes a fixed and frictionless inclined plane, inclined at an angle of  $30^\circ$  to the horizontal rebounds horizontally as shown in the figure. The coefficient of restitution of the ball is



- (A)  $\frac{1}{3}$                       (B)  $\frac{1}{4}$                       (C)  $\frac{1}{5}$                       (D)  $\frac{1}{6}$

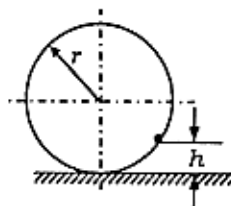
83. Ratio of area moment of inertia of a rectangle and that of a triangle, having same base and height with respect to their common base is

- (A) 2 : 1                      (B) 3 : 1                      (C) 4 : 1                      (D) 5 : 1

84. Two cars are 10 km apart on the same road and are moving in the same direction with the same speed of 40 km/hr. A third car moving in the opposite direction meets these cars at an interval of 8 minutes. The speed of the third car is

- (A) 75 km/hr                      (B) 60 km/hr                      (C) 40 km/hr                      (D) 35 km/hr

85. The height ( $h$ ) from the bottom-most point at which a particle inside a fixed hollow sphere of internal radius  $r$  with coefficient of friction  $\frac{1}{\sqrt{3}}$  can rest is



- (A)  $0.134r$                       (B)  $0.15r$                       (C)  $0.18r$                       (D)  $0.204r$

## Strength of Materials

86. 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 stresses

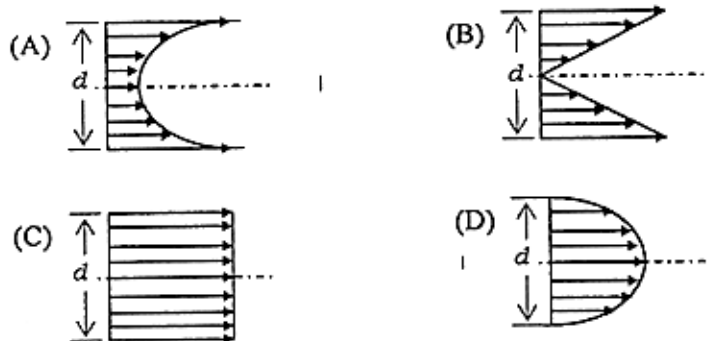
87. The elastic constants  $E$  (Young's modulus),  $G$  (shear modulus) and  $K$  (bulk modulus) of a homogenous and isotropic material are related by

- (A)  $E = \frac{GK}{2K + G}$
- (B)  $E = \frac{6GK}{2K + 3G}$
- (C)  $E = \frac{9GK}{3K + 2G}$
- (D)  $E = \frac{9GK}{3K + G}$

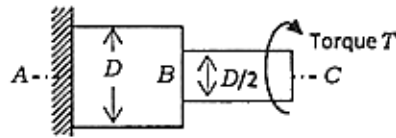
88. A thin cylindrical shell of internal diameter  $D$  and thickness  $t$  is subjected to an internal fluid pressure  $p$ . If  $E$  is the Young's modulus and  $\nu$  is the Poisson's ratio of the cylinder material, then volumetric strain will be

- (A)  $\frac{pD}{4tE}(2 - \nu)$
- (B)  $\frac{pD}{4tE}(1 - 2\nu)$
- (C)  $\frac{pD}{4tE}(5 - 4\nu)$
- (D)  $\frac{pD}{4tE}(4 - 5\nu)$

89. Shear stress distribution along the depth  $d$  of a beam of rectangular cross-section due to transverse force is

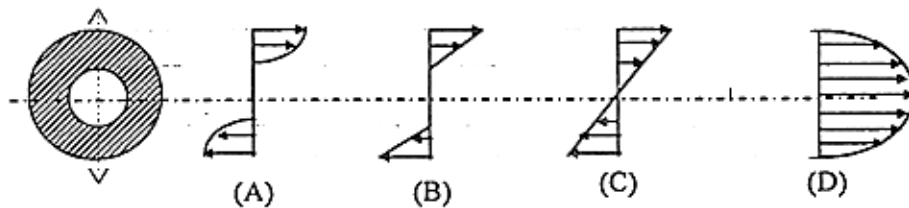


90. A circular shaft fixed at  $A$  has diameter  $D$  for half of its length and diameter  $D/2$  over the other half. A torque  $T$  is applied at its free end (see figure). If the rotation of at  $B$  relative to  $A$  is  $0.1$  radian, then the rotation at  $C$  relative to  $B$  is



- (A)  $0.4$  radian      (B)  $0.8$  radian      (C)  $1.6$  radian      (D)  $3.2$  radian

91. A hollow shaft is subjected to torsion only. The shear stress variation in the shaft along a diameter is given by



92. The state of stress at a point is given by  $\sigma_x = \sigma_y = \sigma$  and  $\tau_{xy} = 0$ . The normal stress on the plane passing through the point and inclined at  $30^\circ$  to the  $x$ -direction is

- (A)  $\sigma$       (B)  $\sqrt{2}\sigma$       (C)  $\sqrt{3}\sigma$       (D)  $2\sigma$

93. Two beams of equal cross-sectional area are subjected to same bending moment. If one of the beams has square cross-section and the other one has circular section, then

- (A) both the beams will be equally strong against the moment  
 (B) the beam with circular cross-section will be stronger against the moment  
 (C) the beam with square cross-section will be stronger against the moment  
 (D) data is insufficient for such comparison

94. The principal stresses at a point are  $80$  MPa,  $30$  MPa and  $-40$  MPa respectively. The maximum shear stress at that point will be

- (A)  $25$  MPa      (B)  $35$  MPa      (C)  $50$  MPa      (D)  $60$  MPa

95. A cantilever beam of length  $L$ , moment of inertia of the cross-section about the bending axis  $I$ , Young's modulus  $E$  carries a concentrated load  $W$  at the middle of its length. The slope of the cantilever beam at the free end is

- (A)  $\frac{WL^2}{2EI}$       (B)  $\frac{WL^2}{4EI}$       (C)  $\frac{WL^2}{8EI}$       (D)  $\frac{WL^2}{16EI}$

96. A square bar of side 4 cm and length 100 cm is subjected to axial tensile load  $P$  and strain energy stored in the body is  $E_1$  (say). The same bar is used as a cantilever beam and subjected to a transverse load  $P$  at the free end. The strain energy absorbed by the body for this case is  $E_2$  (say). Then  $\frac{E_2}{E_1}$  will be
- (A) 16                                      (B) 400                                      (C) 1000                                      (D) 2500
97. Maximum principal stress theory, maximum shear stress theory, total strain energy theory and distortion energy theory are some of the yield criteria for engineering materials. The correct sequence of these criteria in the decreasing order of conservativeness is
- (A) maximum principal stress theory, maximum shear theory, total strain energy theory and distortion energy theory
- (B) maximum shear stress theory, distortion energy theory, total strain energy theory, maximum principle stress theory
- (C) total strain energy theory, maximum shear stress theory, distortion energy theory, maximum principal stress theory
- (D) distortion energy theory, maximum shear stress theory, maximum principal stress theory, total strain energy theory
98. The plane of maximum shear stress at a point also has a normal stress that is
- (A) the maximum                                      (B) the minimum
- (C) zero                                                      (D) average of the bi-axial normal stresses
99. The deflection of closely coiled helical spring with 20 active turns under an axial load of 1000 N is 10 mm. The spring is cut into two pieces with 10 active turns each and placed in parallel under the same load. The deflection in the second arrangement will be
- (A) 10 mm                                      (B) 5 mm                                      (C) 2.5 mm                                      (D) 1.25 mm
100. Under torsion, a chalk (made of brittle material) will fail
- (A) along a plane perpendicular to its longitudinal axis
- (B) in the direction of minimum normal stress
- (C) along surfaces forming a  $45^\circ$  angle with the longitudinal axis
- (D) not in any specific manner

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**Direction :** Question Nos. 71 to 100 for Printing Technology candidates

**Basic Engineering**

71. The process of cutting a flat sheet to the desired shape is known as  
(A) Trimming (B) Crimping (C) Blanking (D) Slitting
72. Which of the following is not a part of steam engine?  
(A) Crosshead (B) Crank (C) Eccentric (D) Camshaft
73. 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
74. Poise is the unit of  
(A) density (B) velocity gradient  
(C) kinematic viscosity (D) dynamic viscosity
75. 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
76. Which of the following materials is not suitable for impact loads?  
(A) Manganese steel (B) Mild steel  
(C) Cast iron (D) Chrome steel
77. The property which enables one material to cut another material is referred to as  
(A) brittleness (B) hardness (C) ductility (D) toughness

78. The best example of semi-liquid lubricant is
- (A) Graphite (B) Grease  
(C) Lard oil (D) Castor oil
79. Which of the following is an example of anti-friction bearing?
- (A) Footstep bearing  
(B) Split bearing  
(C) Rolling bearing  
(D) Plumber block
80. The threads on the lead screw of a Lathe are called
- (A) acme threads (B) square threads  
(C) knuckle threads (D) buttress threads
81. Ductile materials produce
- (A) no chips  
(B) continuous chips with built-up edge  
(C) discontinuous chips  
(D) curly chips
82. Ceramic tools are made from
- (A) aluminum oxide (B) tungsten oxide  
(C) silicon carbide (D) None of the above
83. The ability of a material to resist fracture due to high impact loads is called
- (A) strength (B) stiffness  
(C) toughness (D) brittleness

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84. The property of a material of permanently extending in all directions without rupture by hammering and rolling is called

- (A) Tenacity                      (B) Malleability                      (C) Elasticity                      (D) Ductility

85. Tempering of steel is done to

- (A) increase its hardness and strength                      (B) increase its toughness and ductility  
(C) Both (A) and (B)                      (D) None of the above

### Printing Material Science

86. Some idler rollers are incorporated in the inking system of the sheetfed offset press for

- (A) better metering of ink                      (B) evaporation of entrapped moisture  
(C) better ink transfer                      (D) All of the above

87. Image areas are in recess in which of the following printing process?

- (A) Intaglio                      (B) Gravure  
(C) Waterless Offset                      (D) All of the above

88. Liquid ink is used in which of the following printing process?

- (A) Gravure                      (B) Flexography  
(C) Offset                      (D) Both (A) and (B)

89. Depth of field of fixed focal length camera is \_\_\_\_\_ than that of the SLR camera.

- (A) equal                      (B) lower  
(C) higher                      (D) None of the above



90. Antihalation layer is applied in which side of the process film?
- (A) Top side (B) Bottom side  
(C) Both sides (D) None of the above
91. The keys in the ink duct are used to control the flow of ink in which direction?
- (A) Longitudinal (B) Circumferential  
(C) Both (A) and (B) (D) None of the above
92. The shelf life of PS plate used in the offset process is high due to
- (A) pre-applied light sensitive coating (B) anodizing layer  
(C) sodium silicate layer (D) All of the above
93. Gathering is the term used for
- (A) assembly of individual signature in sequence  
(B) assembly of individual page in sequence  
(C) placing the signature inside the other  
(D) placing the signature outside the other
94. In halftone gravure, which of the following 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 the above

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95. The toe area of a characteristic curve of the process film is called
- (A) over exposure area (B) correct exposure area  
(C) under exposure area (D) None of the above
96. The higher the colour temperature, the light emitted will be rich in
- (A) blue rays (B) yellow rays  
(C) green rays (D) red rays
97. Hydroquinone is inactive below pH value of
- (A) 13 (B) 10  
(C) 11 (D) 9
98. Rosin size is added to the beater to reduce which property of paper?
- (A) Paper strength (B) Absorbency  
(C) Smoothness (D) Opacity
99. Transfer of ink from roller to roller is possible due to the property of ink known as
- (A) tack (B) viscosity  
(C) surface tension (D) Both (A) and (B)
100. To increase the opacity of paper, which is added?
- (A)  $\text{CaCO}_3$  (B)  $\text{TiO}_2$   
(C)  $\text{BaSO}_4$  (D)  $\text{CaCl}_2$

**Direction :** Question Nos. 71 to 100 for Agricultural Engineering candidates

### **Soil and Water Engineering**

**71.** The length of a metric chain used in surveying is

- (A) 100 m (B) 66 m  
(C) 50 m (D) 30 m

**72.** The unit used to measure discharge is

- (A) litre/ha (B) kg/s  
(C) N-m/s (D) litre/s

**73.** A good aquifer material is

- (A) coarse sand (B) medium sand  
(C) fine sand (D) clay

**74.** The pump used for lift irrigation from river is

- (A) Jet pump  
(B) positive displacement-type pump  
(C) centrifugal pump  
(D) turbine pump

**75.** Discharge of a big river can be measured by

- (A) wire  
(B) area-velocity method  
(C) orifice  
(D) V-notch

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76. Minimum runoff can be expected from

- (A) forest (B) agricultural field  
(C) playground (D) urban area

77. Accelerated soil erosion

- (A) is a natural process  
(B) is extremely harmful  
(C) occurs in dry land condition  
(D) can be controlled very easily

78. In active earth pressure, the retaining wall

- (A) is subjected to tension  
(B) is subjected to excessive surcharge  
(C) moves away from the backfill  
(D) moves towards the backfill

79. Possible value of Reynolds number of a laminar flow is

- (A) 5000 (B) 3500 (C) 2500 (D) 1500

80. If total volume and volume of solids of a soil sample are 50 cc and 30 cc respectively, then porosity of the soil is

- (A) 25% (B) 40% (C) 60% (D) 66%

### **Farm Machinery and Power**

81. The compression ratio of a diesel engine normally lies in the range of

- (A) 4-8 (B) 10-14 (C) 16-20 (D) 26-30

82. The r.p.m. of PTO shaft of tractor at rated engine r.p.m. is  
(A) 140 (B) 340 (C) 540 (D) 740
83. 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
84. The grade of lubrication oil generally used in tractor engine is  
(A) SAE 40 (B) SAE 60 (C) SAE 90 (D) SAE 120
85. Ballasting of tractor is done to improve  
(A) field capacity (B) field efficiency  
(C) fuel efficiency (D) tractive ability
86. Which of the following things is not a part of cooling system of tractor?  
(A) Thermostat valve (B) Pump  
(C) Rocker arm (D) Radiator
87. Disc harrow is a  
(A) primary tillage implement (B) secondary tillage implement  
(C) multipurpose tillage tool (D) deep tillage machinery
88. Vertical suction in mould board plough is provided to  
(A) reduce the tool vibration (B) maintain uniform width of cut  
(C) maintain uniform depth of cut (D) pulverize the soil

89. The drum seeder is used for sowing

- (A) jute                      (B) wheat                      (C) paddy                      (D) mustard

90. In Ultra Low Volume (ULV) sprayer, the application rate in litres/ha lies in the range of

- (A) 0.5-9.0                      (B) 10-20                      (C) 30-50                      (D) 100-150

### **Food Processes and Post-Harvest Engineering**

91. In High Temperature Short Time (HTST) pasteurizer, the temperature and holding time is

- (A) 71 °C, 15 seconds                      (B) 61 °C, 30 minutes  
(C) 135 °C, 2 seconds                      (D) 135 °C, 15 seconds

92. The heat transfer efficiency (in percentage) of the Plate-Type Heat Exchanger is

- (A) 30-40                      (B) 50-60  
(C) 70-80                      (D) 90-100

93. In thin layer drying, the grain bed depth, in centimeter, does not exceed

- (A) 10                      (B) 20  
(C) 30                      (D) 40

94. Cyclone separator is used for

- (A) cleaning of grain                      (B) counting of grain  
(C) shorting of grain                      (D) drying of grain

95. The rollers used in sugarcane crusher are

- (A) king roller (B) extracting roller  
(C) crushing roller (D) All of the above

96. For grinding of food/feed material, the machine used is called

- (A) hammer mill (B) inclined plate crusher  
(C) huller (D) extractor

97. Most cereal foods contain mainly

- (A) protein (B) fat  
(C) starch (D) vitamin

98. A unit operation in which water is removed to obtain concentrated liquid products is called

- (A) diffusion (B) dehydration  
(C) evaporation (D) distillation

99. Heat transfer by conduction follows

- (A) Stefan's law (B) Fourier's law  
(C) Newton's law (D) Flick's law

100. The refrigerant commonly used in cold storage in our country is

- (A) ozone (B) nitrogen  
(C) carbon dioxide (D) ammonia

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SPACE FOR ROUGH WORK

SEAL

SEAL

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