

24/2015

Maximum : 100 marks

Time : 1 hour and 15 minutes

1. Who wrote 'Vismayajanakam'?
(A) Kesari Balakrisna pillai (B) Sahodaran Ayyappan
(C) Kandathil Varghese Mappila (D) K.P. Karuppan
2. A.K. Gopalan led 'Pattini jatha' in the year :
(A) 1946 (B) 1931
(C) 1937 (D) 1942
3. The first annual session of SNDP yogam was held at :
(A) Varkala (B) Aluva
(C) Cherthala (D) Aruvippuram
4. On 4th August 2009 the Parliament of India enacted 'Right to Education Act' and included in the Part III of the Indian Constitution. Identify the Article in which the Act is incorporated :
(A) Article 21 a (B) Article 19 a
(C) Article 29 a (D) Article 24 a
5. Which of the following Article is described as 'The heart and soul of the Indian Constitution' by Dr. B.R.Ambedkar?
(A) 19 (B) 32
(C) 21 (D) 51
6. The novel 'Hungry Tide' was written by :
(A) Arundhathi Roy (B) Anitha Desai
(C) Vikram Seth (D) Amitav Ghosh
7. Right to property was repealed by which constitutional amendment?
(A) 42 (B) 93
(C) 44 (D) 73
8. Ezhava Memorial was submitted to which Travancore ruler?
(A) Sreemoolam Tirunal (B) Visakham Tirunal
(C) Swathi Tirunal (D) Chitira Tirunal

9. The famous Jesuit missionary who translated Bible and published it with the title 'vedopadesam'?
- (A) William carey (B) St. Francis X'avier
(C) Benjamin Bailey (D) Herman Gundert
10. Who was the owner of the news paper 'swadeshahhimani'?
- (A) Abdul khader Moulavi (B) K. Sukumaran
(C) K.P. Kesava Menon (D) Ramakrishna Pillai
11. If A is a square matrix of third order with determinant 3, Then the determinant of adj A is :
- (A) 3 (B) 6
(C) 9 (D) 27
12. The coefficient of x^5 in the expansion of $(1+x^2)^5(1-x)^4$ is :
- (A) 30 (B) 60
(C) -40 (D) -60
13. If $K = \sin^4 x + \cos^4 x$, then the value of $2K$ lies between :
- (A) 0 and 1 (B) 1 and 2
(C) 2 and 3 (D) 3 and 4
14. The area enclosed within the curve, $\text{mod } x - \text{mod } y = 1$ is :
- (A) 1 sq units (B) 2 sq units
(C) 3 sq units (D) 4 sq units
15. The circum-centre of the triangle with vertices (4,2), (3,3) and (2,2) is at the point :
- (A) (-3,2) (B) (2,-3)
(C) (-2,3) (D) (3,2)
16. The real valued function $\max(x, x^3)$ is differentiable at the point :
- (A) -1 (B) 0
(C) 1 (D) 2
17. The minimum value of $4x^2 - 4x + 1 + 3\sin x$ is :
- (A) -3 (B) 3
(C) 4 (D) -4

18. The integral of $ax^3 + bx^2 + cx$ between the limits -7 and 7 is a function of :
 (A) a only (B) a and b
 (C) b (D) c
19. The area enclosed between the curves $3ay = x^2$ and $3ax = y^2$, ($a > 0$) is :
 (A) a^2 (B) $3a^2$
 (C) $9a^2$ (D) $6a^2$
20. The solution of the differential equation $xy' = x + y$ satisfying $y = 1$ when $x = 1$ is :
 (A) $y = xe^{x-1}$ (B) $y = x \ln x + x^2$
 (C) $y = x \ln x + x$ (D) $y = \ln x + x$
21. Water absorption for bricks lies between _____ of its dry weight.
 (A) $1/4$ to $1/7$ (B) $1/2$ to $1/4$
 (C) $1/7$ to $1/10$ (D) none of the above
22. For general RCC works in buildings like slabs, beams, columns etc. use _____ grade of concrete.
 (A) M15 (B) M20
 (C) M25 (D) M30
23. The process of curing ensures :
 (A) complete hydration of cement
 (B) to obtain properly hardened concrete
 (C) to obtain strong concrete
 (D) all of the above
24. A triangular plot of sides 65 m, 55 m and 40 m constitute an area of _____ hectares.
 (A) 11 (B) 1.1
 (C) 0.11 (D) none of the above
25. Find the level difference between the stations A and D from the following table.

Station	BS	IS	FS
A	2.500		
B		1.200	
C	1.000		1.100
D			0.750

- (A) 0.250 (B) 0.600
 (C) 1.650 (D) none of the above

26. The number of working stroke per minute in case of four stroke IC engine will be equal to :
- (A) $N/2$ (B) N
(C) $2N$ (D) $4N$
- where N represents the revolutions turned by the crankshaft in one minute.
27. An engine working on an air standard Otto cycle has the following particulars. Piston diameter (bore) = 14 cm, Stroke length = 13 cm, clearance volume = 260 cm^3 . The compression ratio will be :
- (A) 5.28 (B) 6.73
(C) 8.54 (D) 8.69
28. Which is the type of gear employed in a vehicle that makes one rear wheel go faster than the other while rounding a corner?
- (A) Bevel gear (B) Differential gear
(C) Epicyclic gear (D) Worm and worm wheel
29. An economizer is fitted with a boiler is to :
- (A) Increase the steam pressure
(B) Heat the fuel of low calorific value
(C) Heat the air entering the fire grate
(D) Heat the feed water by exhaust flue gases
30. The function of a surge tank in a hydro electric power plant is :
- (A) To supply water at constant pressure
(B) To produce surges in the pipeline
(C) Relieve water hammer pressure in the penstock
(D) To increase the head of water
31. A search light is rated 200V, 1A. It is to be connected to 230V supply. Find the value of resistance to be inserted in series?
- (A) 200Ω (B) 30Ω
(C) 230Ω (D) 15Ω
32. What is the effective resistance of the network consisting of 10 parallel branches each with a resistance of 5Ω ?
- (A) 5Ω (B) 50Ω
(C) 10Ω (D) 0.5Ω

33. How many units of energy is consumed by 100W, 230V lamp working continuously for 10 hours?
- (A) 0.1 (B) 1
(C) 10 (D) 2.3
34. The inductive reactance offered by an RL series circuit having resistance of 10Ω and inductance of 1mH is 0.628Ω . What is the supply frequency?
- (A) 50 Hz (B) 10 Hz
(C) 100 Hz (D) 25 Hz
35. Pipe earthing in an electrical installation is done to :
- (A) Decrease the earth resistance (B) Increase the earth resistance
(C) Maintain constant earth resistance (D) None of the above
36. What is the value of internal resistance of an ideal voltage source?
- (A) Low (B) Zero
(C) High (D) Infinite
37. Which of the following phenomenon is the working principle of light emitting diodes?
- (A) Fluorescence (B) Thermionic emission
(C) Avalanche breakdown (D) Electroluminescence
38. What type of filtering is performed by a shunt capacitor filter used in association with a full wave rectifier?
- (A) Low pass (B) High pass
(C) Band pass (D) Band reject
39. What is the modulation technique used in GSM cellular standard?
- (A) FSK (B) PSK
(C) GMSK (D) AM
40. Which of the following is not an 8-bit microcontroller?
- (A) Intel 8051 (B) Motorola 6811
(C) Zilog Z8 (D) Intel 8086
41. At a given T and P, a liquid mixture of benzene and toluene is in equilibrium with its vapour. The available degrees of freedom are :
- (A) Zero (B) 1
(C) 2 (D) 3

42. Pure O_2 is mixed with air to produce an enriched air containing 50 vol% of O_2 . The ratio of moles of air to O_2 used is :
- (A) 1.72 (B) 0.58
(C) 0.5 (D) 0.2
43. 100 kg of wet solids are to be dried from 80% to 10% mixture (by weight). The mass of moisture removed in kg is:
- (A) 78 (B) 82
(C) 98 (D) 56
44. The average molecular weight of air is :
- (A) 79 (B) 21
(C) 29 (D) 1
45. For air at 100% saturation, the dry bulb temperature and wet bulb temperature are related as :
- (A) Dry bulb > wet bulb (B) Dry bulb = wet bulb
(C) Wet bulb > Dry bulb (D) None of these
46. During the combustion of fuel gas, if the air/fuel ratio is increased, the adiabate flame temperature will :
- (A) Not change (B) Increase
(C) Increase or decrease (D) Decrease
47. A gets converted to B according to the reaction $A \rightarrow B$. If the conversion of A is 50%, what is the mole fraction of A in the exit stream?
- (A) 1/3 (B) 1/2
(C) 1/4 (D) 3/4
48. Which of the following is there in aviation fuel?
- (A) Diesel (B) Naphtha
(C) Petrol (D) Kerosene
49. A coal containing very high percentage of durain is called _____ coal.
- (A) boghead (B) splint
(C) non-banded (D) bright
50. Which of the following is not a product of tar distillation?
- (A) Phenol and naphthalene (B) Anthracene and creosote
(C) Benzol and pitch (D) None of these

51. Which is the fuel used in fast breeder reactor at Kalpakam?
 (A) Thorium (B) Plutonium
 (C) Uranium (D) Uranium 238
52. A coal has an ultimate analysis of carbon: 50%, 6% N_2 , 18% H_2 , 2%S, O_2 : 24%. On what basis this analysis has been given?
 (A) Dry Basis (B) Proximate Basis
 (C) Mineral matter free basis (D) Dry mineral matter free basis
53. The critical speed of a ball mill of radius, R which contains ball of radius r is proportional to :
 (A) $(R-r)^{1/2}$ (B) $R-r$
 (C) $(R-r)^{-1/2}$ (D) $(R-r)^{-1}$
54. The sphericity of a solid particle of cubical shape is :
 (A) $\left(\frac{\pi}{6}\right)^{1/3}$ (B) $\left(\frac{\pi}{6}\right)$
 (C) $\left(\frac{\pi}{6}\right)^{1/2}$ (D) $\left(\frac{\pi}{3}\right)$
55. Calculate the effectiveness of a screen having $x_F = 0.49$, $x_D = 0.94$ and $x_B = 0.023$. The answer is :
 (A) 81.2% (B) 91.3%
 (C) 76% (D) 87.2%
56. Power number and Reynolds number is related in a baffled tank as :
 (A) $N_{Re} < 10, N_p N_{Re} = K_L$ (B) $N_{Re} > 10,000, N_p = K_T$
 (C) Both (A) and (B) (D) None of these
57. For a turbine-agitated and baffled tank, the power number, P_o varies with Reynolds number, R_e at low R_e as :
 (A) $P_o \propto R_e$ (B) $P_o \propto R_e^{0.5}$
 (C) $P_o = \text{Constant}$ (D) $P_o \propto \frac{1}{R_e}$
58. Sticky materials are transported with the help of :
 (A) Apron Conveyor (B) Screw Conveyor
 (C) Belt Conveyor (D) Hydraulic Conveyor

59. To avoid cavitation, the pressure at the pump inlet must exceed the vapour pressure by a certain value called :
- (A) Net Pump Suction Head (B) Net Power Suction Head
(C) Net Positive Suction Head (D) Net Pressure Suction Head
60. The coefficient of velocity, C_v for an orifice is given by :
- (A) $C_v = \frac{\sqrt{4x^2}}{yH}$ (B) $C_v = \frac{\sqrt{2x}}{4yH}$
(C) $C_v = \frac{y^2}{\sqrt{4xH}}$ (D) $C_v = \frac{x^2}{\sqrt{4yH}}$
61. A bed consists of particles of density 2000 kg/m^3 . If the height of the bed is 1.5 m and its porosity is 0.4, the pressure drop required to fluidize the bed is :
- (A) 25.6 kPa (B) 11.77 kPa
(C) 14.86 kPa (D) 21.13 kPa
62. Water flows through an orifice of 25 mm diameter situated in a 75 mm pipe at the rate of $300 \text{ cm}^3/\text{s}$. What will be the difference in level in a water manometer connected across the meter? Given coefficient of discharge $C_0 = 0.61$, viscosity of water $= 1 \text{ mNs/m}^2$:
- (A) 5 cm (B) 7 cm
(C) 9 cm (D) 11 cm
63. Quick sand is a :
- (A) bingham plastic (B) pseudo plastic
(C) newtonian fluid (D) dilatant
64. Diaphragm pumps are used for :
- (A) low pressure (B) high pressure
(C) toxic or corrosive (D) none of these
65. Which one of these is the commonly used final control element?
- (A) Orifice plate (B) Dall flow tube
(C) Thermistor (D) Pneumatic valve
66. Manometers are used to measure :
- (A) low pressure (B) high pressure
(C) low or high pressure (D) all of the above

67. Which one of the following is used for liquid level measurement?
 (A) Rotameter (B) Diaphragm box
 (C) Diaphragm guage (D) None of these
68. Proportional Band (PB) lies in the range :
 (A) $1 \leq PB \leq 500$ (B) $500 \leq PB \leq 1000$
 (C) $1 \leq PB \leq 100$ (D) $50 \leq PB \leq 250$
69. Molasses is the starting material for the production of :
 (A) alcohol (B) oil
 (C) fatty acids (D) starch
70. Tinitro toluene is :
 (A) used in glycerine manufacture (B) used in dye manufacture
 (C) used in pulping process (D) none of the above
71. Solvent used for the extraction of oil :
 (A) Acetone (B) Methyl Ethyl ketone
 (C) Hexane (D) Furfural
72. Raw materials for solvay process are :
 (A) Salt, limestone and coke or gas (B) Ammonia, salt and limestone
 (C) Ammonia, limestone and coke (D) None of these
73. Catalyst used in the manufacture of sulphuric acid by contact process is :
 (A) Cr_2O_3 (B) V_2O_5
 (C) Iron (D) Oxides of nitrogen
74. Sizing material is incorporated in paper to :
 (A) increase its thickness (B) increase its brightness
 (C) increase its strength (D) none of these
75. The process used for the manufacture of ethyl alcohol from molasses :
 (A) distillation (B) dehydration
 (C) fermentation (D) dehydrogenation
76. Which of the following is an explosive?
 (A) nitroglycerin (B) trinitrotoluene
 (C) cellulose nitrate (D) all of the above

77. Chemical name of caustic soda is :
(A) Sodium hydroxide (B) Sodium carbonate
(C) Sodium bicarbonate (D) Potassium carbonate
78. Which of the following is a method for production of phosphoric acid?
(A) Solvay process (B) Sulphate process
(C) Electric furnace process (D) None of these
79. Which of the following is not a source of starch?
(A) Sorghum (B) Sago
(C) Cassava (D) None of these
80. What is the full form of DDT?
(A) Dichloro diphenyl trichloro ethane
(B) Dichloro diphenyl tetrachloro ethane
(C) Dichloro diphenyl trichloro methane
(D) Dichloro diphenyl tetrachloro methane
81. Raw material for the manufacture of nylon-66 :
(A) Adipic acid (B) Acetic acid
(C) Ethylene (D) Nylon
82. Terylene is :
(A) same as decron (B) a polyester
(C) both (A) and (B) (D) neither (A) nor (B)
83. Which of the following is a raw material for the production of nitrile rubber?
(A) Acrylonitrile (B) Butadiene
(C) Both (A) and (B) (D) Neither (A) nor (B)
84. Caprolactum is produced from :
(A) Phenol (B) Naphthalene
(C) Pyrieline (D) None of these
85. Prandtl number is the ratio of :
(A) Thermal diffusivity to kinematic viscosity
(B) Conductive resistance to convective resistance
(C) Momentum diffusivity to thermal diffusivity
(D) Thermal diffusivity to momentum diffusivity

86. Dankwert's surface renewal theory is given by :

(A) $\frac{k_L}{D_A^2}$

(B) $k_L^2 D_A$

(C) $\frac{k_L^2}{D_A}$

(D) $\sqrt{K_L^2 D_A}$

87. In a binary distillation operation, if the feed contains 30 mol % vapour, the slope of the q line will be :

(A) 2.3

(B) -2.3

(C) 0.3

(D) -0.3

88. In a distillation separation, distillate contains 80% more volatile component. The q -line intersects the equilibrium curve at (0.3, 0.6). Find the minimum reflux ratio, consuming Mc.Cabe Thiele method :

(A) 0.67

(B) 1.5

(C) 0.33

(D) 0.4

89. NTU is considered as a :

(A) Performance of the equipment

(B) Measure of departure from ideality

(C) Measure of approach to ideality

(D) Measure of difficulty of separation

90. Packed tower operates at :

(A) Low pressure drop and low hold up

(B) Low pressure drop and high hold up

(C) High pressure drop and low hold up

(D) High pressure drop and high hold up

91. A composite wall of a furnace is made of two materials A and B. The thermal conductivity of A is twice that of B and the thickness of A is half of B. If the temperatures at 2 sides of the wall are 400 and 1200 K respectively, the temperature drop (in K) across the layer of material A is :

(A) 400 K

(B) 200 K

(C) 160 K

(D) 100 K

92. The heat transfer by radiation from a mild steel surface is to be reduced by reducing the emissivity of the surface. This can be achieved by :

(A) Painting the surface black

(B) Painting the surface white

(C) Giving surface a mirror finish

(D) Roughening the surface

93. In Sieder – Tate correlation, the heat transfer coefficient varies with pipe diameter D as :
- (A) $h \propto D^{\frac{1}{3}}$ (B) $h \propto D^{\frac{1}{2}}$
(C) $h \propto D^{0.8}$ (D) $h \propto D^{0.2}$
94. For a given heat flow and for the same thickness, the temperature drop across the material will be maximum for :
- (A) Copper (B) Steel
(C) Aluminium (D) Glass-wool
95. Economy of a single effect evaporator is :
- (A) > 1 (B) < 1
(C) $= 1$ (D) None of these
96. Type of feeding used for heat sensitive material in a multiple effect evaporator is :
- (A) Forward feed (B) Backward feed
(C) Mixed feed (D) Parallel feed
97. Which one of the following is a secondary method for treating wastewater?
- (A) Screening (B) Reverse osmosis
(C) Activated sludge process (D) None of these
98. Reagent used for COD determination is :
- (A) Potassium chromate (B) Iron nitrate
(C) Potassium dichromate (D) None of these
99. Which of the following is an air pollutant?
- (A) Nitrogen oxides (B) Sulphur dioxide
(C) Carbon monoxide (D) All of the above
100. Which of the following is a sludge treatment method?
- (A) Sedimentation (B) Trickling filtration
(C) Incineration (D) None of these