CASCADING   TEST -1

- ➤ DATE………………..16/08/2015

- ➤ TIME…………………..…2.5Hrs

- ➤ TOTAL QUESTION…..………….50

- ➤ NEGATIVE MARKING………….1/4

- ➤ TOTAL MARKS………………........

SYLLABUS

1. **THERMODYNAMICS**

2. **PRODUCTION**

3. **MD**

4. **SOM**

5. **INDUSTRIAL**

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CASCADING -1

1. An annealed copper strip of 228 mm width and 25 mm thickness is rolled to a thickness of 20 mm in one pass. If roll radius is 300 mm and the rolls rotate at 100 rpm. Rolling force required is (Average yield stress = 179. 3 MPa):-

   (a) 1.6 MN   (b) 2.6 MN

   (c) 3.6 MN   (d) 4.6 MN

2. An electron beam welding unit operating at 100 kV and rated at 1 kW. If beam has a diameter of 0.5 mm and power density of 5×10^6 kW/m², the velocity of electron and power of the beam respectively are:

   (Take $m_{electron} = 9 \times 10^{-31}$ kg, 1 eV = 1.6×10^{-19} J)

   (a) 0.187×10^9 m/s, 982 W

   (b) 0.467×10^8 m/s, 1473 W

   (c) 0.233×10^9 m/s, 982 W

   (d) 0.598×10^8 m/s, 1718 W

3. Which of the following non-destructive testing (NDT) method would be used to examine a completed weld for surface defects?

   (a) Ultrasonics

   (b) Dye penetrant

   (c) Radiography

   (d) Acoustics

4. Consider the following statements:- Penetration can be improved by

   1. Increasing heat input

   2. Increasing the travel speed during welding.

   3. Changing the joint design

   Which of the above statements is/are correct:-

   (a) 1 only

   (b) 1 and 3 only

   (c) 2 and 3 only

   (d) 2 only

5. Tool signature of a cutting tool that used for turning operation in 'ASA' system is given below.

   8 - 4 - 6 - 6 - 6 - 15 - 0 .125

   In ORS of tool nomenclauture, value of rake angle and inclination

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angle respectively are.

(a) $4.75°, 5.36°$

(b) $5.94°, 6.70°$

(c) $3.56°, 4.03°$

(d) $1.78°, 8.75°$

6. ----------colour shows the machined surface in colour scheme of pattern.

7.
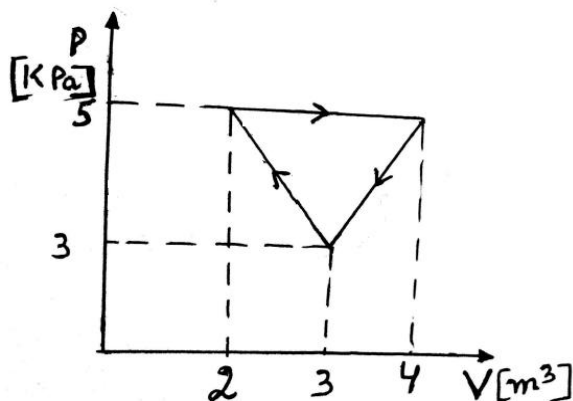
For the cycle shown on pressure volume diagram ,the magnitude of compression work and efficiency of the cycle respectively are

(a) 8 KJ and 20%

(b) 4 KJ and 25%

(c) 8 KJ and cannot be determinend

(d) 4 KJ and 80%

8. Consider the following statements:

1. Constant pressure lines on h - s diagram diverge as entropy increases.

2. Amount of work done from cascaded carnot engines corresponding to fixed temperature difference remains same as one goes to lower absolute level temperature.

3. In isothermal expansion, entropy increases with no degradation of energy.

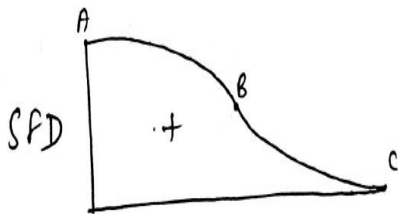Which of the statements given above is/are correct?
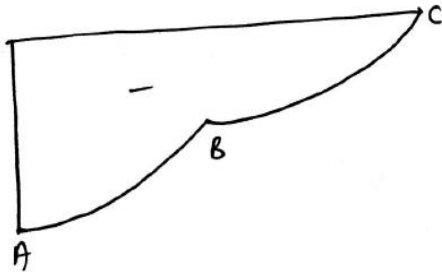
(a) 1 only

(b) 2 and 3

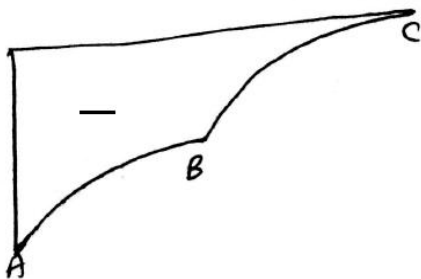(c) both 1 and 2

(d) All are correct

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9. BMD corresponding to SFD given below is.
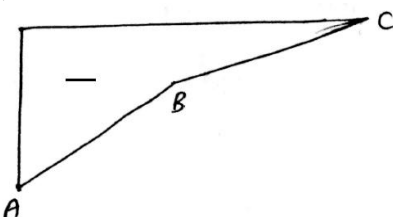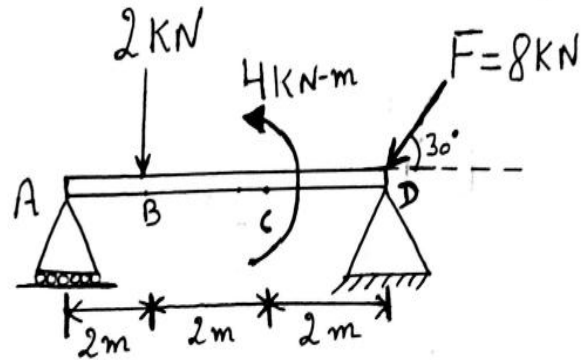

SFD

(a)

(b)

(c)

(d) None of these

10. Consider the following diagram:-

Reaction at A and D is

(a) 2 kN, 4 kN

(b) 3 kN, 3 kN

(c) 4 kN, 2 kN

(d) 2 kN, 8 kN

11. When a 30 mm dia rod is subjected to on axial pull of 5000 KN. It was found that dia is chaged to 29.891 mm. Value of μ and E respectively is

[Value of shear modulus G is 70 GPa]

(a) 0.77 and 150.84 GPa

(b) 0.67 and 150.84 MPa

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(c) 0.67 and 150.84 GPa

(d) 0.77 and 150.84 MPa

12. A cylindrical shell 900 mm long, 150 mm internal diameter, having a thickness of metal 8 mm, is filled with a fluid at atmospheric pressure. If an additional 20000mm³ of fluid is pumped into the cylinder, the pressure exerted by the fluid on the cylinder is ----------- N/mm²

[Take $E = 2 \times 10^5$ N/mm² and $\mu = 0.3$]

Common Data Q 13 - 14

1.5 kg of liquid having a constant specific heat of 2.5 kJ/kg K is stirred in a well insualted chamber causing the temperature to rise by $15° C$

13. The amount of work done on the system is ------------ kJ

14. If the same liquid is stirred in a conducting chamber, 1.7 kJ of heat is transferred from liquid to the surroundings, while the temperature of the liquid rises to $15° C$. The amount of work done on the system in this case is ------------- kJ

15. The voltage current characterstic for a DC source for arc welding is linear with open circuit voltage of 80 v and short circuit current of 600 A. The max arc power of the source will be.

(a) 48 KW   (b) 6 KW

(c) 24 KW   (d) 12KW

16. For a specific purpose electro chemical machining [ECM] of an iron surface [25 mm × 25 mm] is done using NaCl in water as electrolyte. The current supplied is 1000 A. The electrode feed rate in [mm/min] is --------------

[Valency of iron = 2, Atomic weight = 55.85, Density = 7860 kg/m³]

17. A round plate of diameter 500 mm has to be faced on both sides to reduce its thickness from 30 mm to 20 mm. Depth of cut is 2.5 mm. Cross feed is 0.05 cm/rev. and plate rotates at 500 rpm. The machining time for the process is.

(a) 1 min   (b) 2 min

(c) 4 min   (d) 3 min

COMMON DATA Q 18 - 19

Two steel sheets of 1.5 mm thickness are spot welded in a lap joint with a current of 10000 A for 0.2 sec.

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The effective resistance of the joint is $100 \ \mu\Omega$. Electrodes of diameter 5 mm are used. The latent heat of melting is 1200 kJ/kg and density of metal is 8000 kg/m³

18. What is percentage heat loss to the surroundings

    (a) 36%   (b) 65%

    (c) 72%   (d) 80%

19. If the heat lost to the surroundings is to be reduced to 50% then what should be the percentage decrease in current required to be supplied.

    (a) 20%   (b) 40%

    (c) 50%   (d) 60%

20. A plate has to be rolled in one pass with a roll diameter of 500 mm. Plate enters with a speed of 15 m/min and leaves the rolls with a speed of 18 m/min. If final plate thickness is 0.6 times the initial thickness, the percentage change in the width is --------%.

21. A shaft and hole pair is designated as 30 H_7 d_8. This assembly constitutes
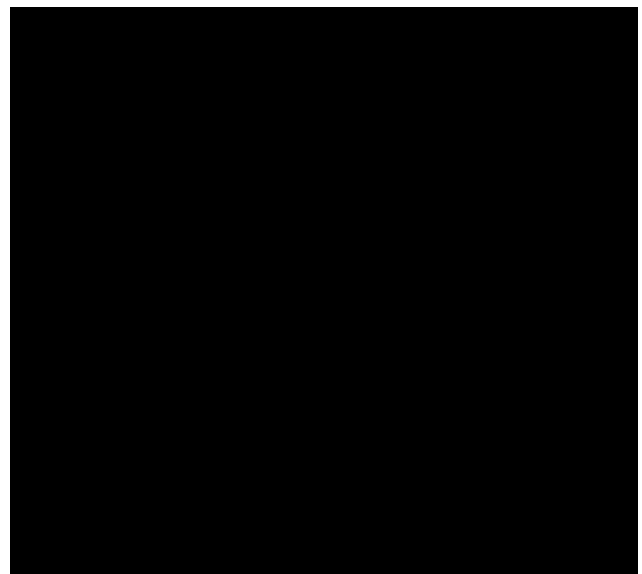
(a) Interference fit

(b) Transition fit

(c) Clearance fit

(d) None of the above

22. A simple band brake is to absorb 4.5 kW at 150 rpm. The coefficient of friction is 0.12 and the maximum pressure between the lining and the drum is to be 700 kPa. The width of the band (if the drum diameter is 300 mm and the angle of wrap is $215°$) is --------.

23. A riveted joint (with four rivets numbered 1 to 4)as shown in the fig is subjected to an eccentric loading. The least and the most stressed rivets respectively are

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(a) 2 and 4   (b) 4 and 2

(c) 1 and 3   (d) 3 and 1

24. In a steam engine the maximum steam pressure is 1.5 N/mm². Absolute and the back pressure is 0.514 N/mm². The cylinder diameter is 0.3 m. What will be the core diameter of the screwed end of the piston rod when the allowable stress of mild steel is 45 N/mm² in tension?

(a) 44.4 mm   (b) 53.3 mm

(c) 34.2 mm   (d) 65.6 mm

25. The mean radius of the screwed part of the bolt is 9 mm, and the pitch is 1/3 cm. Angle of V. threads in the bolt is $60°$. The helix angle is ------------------.

26. Starting friction is low in

(a) Hydrostatic lubrication

(b) Hydrodynamic lubrication

(c) Mixed (or semi fluid) lubrication

(d) Boundary lubrication.

27. Which one of the following is true for involute gears?

(a) Interference is inherently absent

(b) A convex flank is always in contact with concave flank

(c) Pressure angle is constant thorought the teeth engagment.

(d) None of the above

28. Suppose 85 kJ of heat is supplied to a closed system at constant volume. During the next process, the system rejects 90 kJ of heat at constant pressure while 20 kJ of work is done on it. The system is brought to the original state by an adiabatic process. The initial internal energy is 100 kJ. The quantity of work transfer during the process is ....KJ.

29. A steam turbine receives steam steadily at 10 bars with an enthalpy of 3000 kJ/kg and discharges at 1 bar with an enthalpy of 2700 kJ/kg. The power output is 3.5 kW and mass flow rate is 12 kg/s. Ignoring the changes in kinetic and potential energies, the rate of heat transfer from the turbine casing to the surroundings is....................W.

30. An electric motor of 5 kW is subjected to a breaking test for 1

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hour. The heat generated by the frictional forces in the process is transferred to the surroundings at $20°C$. The entropy change in the process. in kJ/K is..................

31. If an engine of 40 % thermal efficiency drives a refrigerator having a coefficient of performance of 5. The heat input to the engine per kJ of heat removed from the cold body of the refrigerator is ....KJ.

32. A heat pump is used to heat a house in the winter and then reversed to cool the house in the summer. The inside temperature of the house is to be maintained at $20°C$. The heat transfer through the house walls is 7.9 kJ/s and the outside temperature in winter is $5°C$. The minimum power (approximate) required to drive the heat pump is ....W

33. Experiments indicate that about 0.522 kW/m² of energy can be collected on a plate operating at $85°C$. This energy is to be transferred to a heat engine to produce 1 kW of useful shaft power. The heat engine rejects heat to atmosphere at $25°C$. Determine the efficiency of the heat engine and minimum collector area of the plate.

34. A company has an annual demand D of certain equipments. If its holding cost per annum per piece is equal to the ordering cost per order, then economic order quantity will be equal to

(a) $\sqrt{D}$ (b) $\sqrt{2D}$

(c) $\sqrt{D/2}$ (d) Indeterminate

35. In company, the maximum inventory level of certain material is 500 units, where replenishment is in single lot only. The inventory is consumed at uniform rate and remains nil for one month in every cycle of purchase throughout the year. Ordering cost is Rs. 200 per order and inventory carrying cost is Rs. 20 per item per month. Annual cost (in rupees) of the inventory ordering and holding is

(a) 1200   (b) 30000

(c) 31200   (d) 61200

36. Annual demand for a product costing Rs. 100 per piece is 900. Ordering cost per order is Rs. 100 and inventory holding cost is Rs. 2 per unit per year. The economic lot size is.

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(a) 200 (b) 300

(c) 400 (d) 500

37. ABC analysis in materials management is a method of classifying the inventories based on

(a) The value of annual usage of the items

(b) Economic order quantity

(c) Volume of material consumption

(d) Quantity of materials used

38. For inventory control, the following data is given for a factory.

Annual requirement	15,000 units
Preparation cost	Rs. 25/order
Inventory holding cost	Rs. 5/unit/year
Production rate	100 units/day
Working days	250/year

The number of production runs and the total incremental cost respectively are..., ...

39. A solid shaft is to transmit 300 kW at 120 rpm. The shear stress is not to exceed 100 MPa. It is desired to reduce the weight of the shaft by replacing it by a hollow shaft with diameter ratio of 0.6 keeping other parameters same. The diameter of solid shaft and percentage saving of the material by using hollow shaft are......., ...

40. In a torsion test, the specimen is a hollow shaft with 50 mm external and 30 mm internal diameter. An applied torque of 1.6 kNm is found to produce an angular twist of $0.4°$ measured on a length of 0.2 m of the shaft. The Young's modulus of elasticity obtained from a tensile test has been found to be 200 GPa. The modulus of elasticity and the Poisson's ratio of the material respectively are .....GPa ,.............

41. A ductile component is subjected to dynamic stress varying between 150 MPa and 250 MPa. The ultimate tensile strength of the material is 450 MPa, yield point in tension is 250 MPa, and endurance limit for reversed bending is 150 MPa. The factor of safety for the design of the component is.............

42. A journal bearing supports a shaft that rotates at 1800 rpm. Clearnace to radius ratio is 1/120. Viscosity of the lubricant is $\mu = 30 \times 10^{-3}$ Pa-s and bearing pressure is 2.4 MPa. Sommerfeld number is given by......

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43. A thin cylindrical pressure vessel of 180 mm diameter and 2 mm thickness is subjected to an internal pressure varying from 8 to 12 MPa. Assume that the yield, ultimate and endurance strength of material are 625, 850 and 410 MPa, respectively. The factor of safety for Goodman's criteria is........

44. Two hollow shafts of the same material have the same length and outside diameter. Shaft 1 has internal diameter equal to one third of the outer diameter and shaft 2 has internal diameter equal to half of the outer diameter. If both the shafts are subjected to the same torque, the ratio of their θ_1/θ_2 will be equal to

(a) 16/81   (b) 8/27

(c) 19/27   (d) 243/256

45. Maximum shear stress in a solid shaft of diameter D and length L twisted through an angle θ is τ. A hollow shaft of same material and length having outside and inside diameters of D and D/2, respectively, is also twisted through the same angle of twist θ. The value of maximum shear stress in the hollow shaft will be

(a) $16\tau/15$ (b) $8\tau/7$

(c) $4\tau/3$ (d) τ

46. Two shafts A and B are made of the same material. The diameter of shaft B is twice that of shaft A. The ratio of power which can be transmitted by shaft A to that of shaft B is.

(a) 2   (b) 4

(c) 8   (d) 16

47. A thin rectangular steel plate 100 mm × 50 mm undergoes deformations of 0.05 mm and 0.01 mm is longitudinal and lateral directions. The modulus of elasticity of steel is 200 GPa and Poisson's ratio is 0.3. The stresses in the longitudinal and lateral directions respectively are....MPa,.....MPa.

48. A solid phosphor bronze shaft 60 mm in diameter is rotating at 800 rpm and transmitting power under torsion only. An electrical resistance strain gauge mounted on the surface of the shaft gives strain reading as 3.98×10^{-4}. The modulus of elasticity for phosphor bronze is 105 GPa amd poisson ratio is 0.3. The maximum power that can be transmitted by the shaft is........KW.

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49. What is forecast for 4th period according to data given beow

Period	Actual demand	Weightage
1	105	0.1
2	108	0.3
3	112	0.6

(a) 101.8   (b) 103.4

(c) 106.6   (d) 110.1

50. In a forecasting situation, exponential smoothening constant α is 0.2. If demand for the nth period is 500 and actual demand for corresponding period turned out to be 450. What is forecast for (n+1)th period?

(a) 450   (b) 470

(c) 490   (d) 500

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