



# CBCS SCHEME

17MN44

## Fourth Semester B.E. Degree Examination, Aug./Sept.2020 Mine Mechanization - I

Time: 3 hrs.

Max. Marks: 100

**Note: Answer any FIVE full questions, choosing ONE full question from each module.**

### Module-1

- 1 a. Explain the laws governing compression and expansion of Gases. (10 Marks)  
b. Derive the work done formula for Isothermal compression. (10 Marks)

**OR**

- 2 a. Explain the utilization of compressed air in Jack Hammer and Rocker Shovel. (10 Marks)  
b. Derive the work done formula for adiabatic compression. (10 Marks)

### Module-2

- 3 a. Explain constructional details of interlocking wedge type capel with figure. (10 Marks)  
b. A Direct Rope haulage pulls 10 loaded tubs at a time up an incline dipping at 1 in 8. An empty tub weighs 400 kgf and has a capacity of 900 kgf of minerals. Length of the roadway covered by the haulage is 500m. The rope diameter is 25mm. rope speed is 12 kmph. Coefficient of friction for the tubs and for rope is  $\frac{1}{20}$ . Estimate the power required by the rope and by the engine. (Assume mass in kg per meter length of rope =  $kd^2$ . Where  $K = 0.35$ ,  $d = \text{dia of rope in cm}$ ). (10 Marks)

**OR**

- 4 a. Explain the gravity haulage with its construction and figure. (10 Marks)  
b. What is the least gradient for a Self Acting Incline ; 300 meters long to work with 10 tubs on each train, each tub weighing 0.25 tonns and carrying 0.6 ton of coal? The rope weighs 0.75kg/meter. (Assume Friction of tubs =  $\frac{1}{56}$  ; Friction of rope =  $\frac{1}{10}$ ). (10 Marks)

### Module-3

- 5 a. Explain the manual take-up and gravity take-up tensioning arrangement with figures for belt conveyor. (10 Marks)  
b. Calculate the carrying capacity of coal of a 900mm belt conveyor when the cross – section of the load is 0.0746 square cm and the belt moves at a speed of 125m/min. Assume  $1m^3$  of coal weighs 800 kgs. (10 Marks)

**OR**

- 6 a. Explain the diesel and electric battery operated locomotives and also compare them. (10 Marks)  
b. Find the effective H.P. exerted by a locomotive engine which draws a train up an incline of 1 in 100 at the rate of 50 km per hour. The weight of the engine and train is 92 tonnes and the frictional resistance is 6kg per tonne. (10 Marks)

**Module-4**

- 7 a. Explain the various kinds of drum winding and also compare it with koepe winding. (10 Marks)
- b. Calculate the torques (Static and Dynamic) at different stages for a tower mounted friction winder with the following data :
- Loaded skip weight = 8 tef ; Empty skip weight = 4.5 tef ;  
 Rope weight = 5.78 kgf/m length ; Friction Drum diameter = 2m ;  
 Acceleration time,  $t_a = 16$  seconds ; Constant speed time,  $t_c = 30$  seconds ;  
 Retardation time,  $t_r = 10$  seconds ; Decking time,  $t_d = 15$  seconds ;  
 Maximum Rope speed = 8.15 m/s ; Shaft depth = 350m ;  
 Tower height = 30m ; Bottom Rope loop = 10m.
- Moment of inertia of the friction pulley and the motor geared to it, referred to the axis of friction pulley is 24 tonne – m<sup>2</sup>. Assume static torque due to friction 0.08 time the torque due to loaded skip plus empty skip. (10 Marks)

**OR**

- 8 a. Explain the multi rope system of winding with advantages and disadvantages. (10 Marks)
- b. A winding engine hoist per wind 3 tef of pay load of copper ore in 2 mine cars up a vertical shaft, 600m deep. As the loaded cage comes up, the empty cage with two mine cars goes down. The caged used has two decks, each deck accommodating 1 mine car of tare 0.75 tef. Weight of cage , the cage chains and suspension gear is 5 tef. The duty cycle consists of acceleration 10 sec ; constant speed 30 sec ; deacceleration 10 sec ; decking period 10 sec. The winding rope weighs 5.5g kg f/m length. Length of rope from top cage to drum when decking is 36m and there is also 40m of dead rope always on each side of the drum. The headgear pulleys are 4.2m diameter and each weighs 2 tef. Calculate the torque at different stages of winding. (Assume strand rope weighing 5.59 kg/m is of 38mm diameter. Drum dia is nearly 120 X rope dia). For cylindrical drum without tail rope. (Assume a winding drum of 4.4m diameter and weighing 30 tef). (10 Marks)

**Module-5**

- 9 a. Explain various kinds of safety devices on winders. (10 Marks)
- b. Explain the Pit – top layout with run – round arrangement including figure. (10 Marks)

**OR**

- 10 a. Explain the mechanical braking system of winders with figure. (10 Marks)
- b. Explain the back – shunt circuit arrangement in pit – top layout with figure. (10 Marks)

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